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EXPERIMENTS IN GEOGRAPHICAL DESCRIPTION*

BY

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THE PRESENT CONDITION OF OUR ASSOCIATION

The exploration of unknown lands and seas has, to my regret, seldom been the subject of essays presented before our Association. It would appear that most of those who are active or bold enough to make their way far from the beaten track do not care for the more thorough study of geography to which we are pledged; or perhaps that we, with our interest in the more scientific and analytical aspects of geography, have not been sufficiently cordial to those explorers who go far from home and bring back narratives in which personal adventure almost necessarily has a large place. Nevertheless, we have not been altogether wanting in this respect. We have heard in earlier meetings something of the desert basins of inner Asia, of the lofty plateaus of the Andes, and of the great territory of Alaska; and I trust that we shall again from time to time have reports on distant parts of the world, particularly when they can be presented with such technical geographical skill as characterized the papers just referred to. Some such papers are listed in our program for this meeting, but if I thus call especial attention to the recent studious travels of Messrs. Woodworth, Huntington and Martin, it would be unfitting not to add at least a few words on the extraordinary geographical achievements of the year now closing; a year that has

* Presidential address at the meeting of the Association of American Geographers held in Cambridge, Mass., Dec. 30, 1909, modified and extended in certain points.

brought us the news of the most remarkable advances in polar exploration ever made. Although our own work is mostly performed in well-known lands, we must recognize and admire the brave strength of purpose, the persistence in the face of exhausting hardships, which enabled Peary to reach one pole and Shackleton so very nearly to reach the other.

The work of our members has naturally been limited for the most part to our own country. It was at first feared that it might also be limited too closely to the physiography of the lands, because so many of us had been more concerned with that division of geography than with any other; but if we have at any time deserved that reproach, the meeting of last winter at Baltimore merited and indeed received altogether different comment; for Professor Penck, who was then our guest, described it as giving a well-distributed attention to various phases of our subject; and Dr. Gilbert, our president at that time, considered the meeting to be a thoroughly serious and scientific assembly. These two opinions are surely most encouraging; yet we still have work to do in the way of broadening our relations. We would willingly see oceanography and climatology more fully represented on the inorganic side of geography, and on the organic side there is pressing need of more attention to the geography of plants, animals and man than has yet been given. We therefore have abundant room for expansion, and I beg each and all of you to use all appropriate efforts to make our needs known in these several directions. As a practical step in this direction, I suggest that we invite representatives of allied subjects, such as history, economics and biology, to address us from time to time on their conception and use of geography.

We have, I believe, still the distinction of being the only geographical society in the world in which some definite geographical accomplishment is required for membership. I trust that such a qualification will be carefully maintained. We have probably the further distinction of being the smallest geographical society in the world; we are indeed so small that it is difficult and disappointing to believe that all the trained and productive geographers in North America are included in our list of some eighty names. Let me, therefore, commend the discreet nomination of new names to the council, always provided that the nominees have reached the stage of studious and original geographical production; and let me even more particularly advise that personal invitation be given to earnest younger students of geography to attend our meetings as

guests of the association, in the hope that what they see and hear among us will encourage them to secure serious professional equipment and to reach active production in geographical science. In due time, they having become members, it will be their turn to maintain our simple organization and to foster its fuller development.

Examples of Unsystematic Description

The particular subject on which I wish to address you to-day concerns, as you might expect, the study of land forms, and more especially the manner in which land forms may be effectively described by mature observers, so that they may be appreciated by mature readers. Let me consider with you whether it is desirable and practicable to make at least some approach to systematic methods in describing the landscapes with which every geographer has to deal in the narrative of his travels, or in the account that he gives of particular areas in his regional studies. My own answer to this question is decidedly in the affirmative, and I propose to illustrate at once the need and the value of some sort of systematic method by the rather invidious device of giving an example of unsystematic description, taken from the first geographical journal on which my hand happened to fall after the intention to cite such an example was formed. The following abstract, therefore, presents all the statements concerning the structure and form of a certain mountain range, in the order in which they are presented in the essay referred to; but distances, directions and other details are changed so that the source of the abstract can hardly be identified, and a considerable amount of general description that is aside from my purpose is omitted.

The mountain mass, entirely isolated and having a very remarkable geological constitution, is a high range, which rises abruptly at its northern end in the form of a great escarpment, surmounting the plain by some 3,000 or 4,000 feet; the range continues in an almost direct course to the south for about 40 miles. The summit is of very difficult access, the rocky wall being nearly vertical and mostly bare for the uppermost 1,500 feet. There is said to be no deep pass through the range. At an elevation of 2,000 or 3,000 feet there are grassy benches. On all sides the crests are very steep, with altitudes of from 4,500 to 6,000 feet; the culminating point rising to 6,300 feet. The crest is not continuous. Erosion has dissected the top of the mountain into a multitude of knobs and small plateaus. The entire range is formed of sandstones, inclined in general at an angle of 45°, and trending like the range from north to south. The sandstones rest on granite, which reaches an altitude of 1,900 feet

at the village of Blank; while near River So-and-so the sandstones are seen at an altitude of 1,200 feet. On certain lower terraces, horizontal sandstones are deposited. The range has the appearance of constituting the eastern limb of an anticline, but it is difficult to explain in what way erosion has removed the sandstones of the western limb from the plain, since they form a heavy body in the range. Deep V-shaped valleys, parallel to one another, veritable torrent beds, are seen in large number on the eastern flank. After reaching the foot of the range, at an altitude of 1,000 feet, the torrents become quiet streams.

Part of this description is rather baffling. For example, what is the general form of the top of the mountain, in which erosion has produced a multitude of knobs and small plateaus? On reaching this statement, after having previously read that the summit is of difficult access, the upper rocky walls being nearly vertical and the crest very steep on all sides, one might make the provisional inference that the mass was of horizontal structure, like a lava-capped mesa; but this inference is not consistent with the earlier statement regarding the well defined north-south trend of the range, and it is explicitly contradicted by reading, a little farther on, that the mountain is formed of inclined sandstones. One must feel rather vexed not to be told at once in which direction the sandstones dip; for until such information is given, the reader has to keep two pictures floating in his mind; one of an east-dipping monoclinal range, the other of a west-dipping monoclinal range. But he may throw away the second picture after reading a little farther and coming to the comparison of the range with the eastern limb of an anticline, of which the western limb is lost. This is the only indication given by the observer that the dip of the sandstones is to be east. The absence of the western limb of the postulated anticline tempts the reader to suppose that the range, instead of being part of an anticline, is really an east-tilted and dissected fault-block; even though the observer, after he has himself discredited the suggestion of anticlinal structure, says nothing about this manifest possibility. Theoretical discussion is therefore as fragmentary as the record of observation. In fine, the more carefully one reads the article, the more one is impelled to say that certain important items are omitted; that such items as are mentioned are introduced in no apparent order; and that the method of treatment is uneven and arbitrary and accidental, being explanatory in one part and empirical in another.

By rearranging the facts presented, the reader may form a more systematic description. In the absence of explicit statement to the

contrary, normal erosion is naturally assumed to have caused whatever changes have been produced during the development of the existing form from the initial form. The systematic description may then proceed as follows: The range, trending north and south, with altitudes of from 4,500 to 6,000 feet, is a monocline of heavy sandstones which dip eastward, and which are underlaid by granite along the western flank. The northern termination is a high cliff; the southern end is left undescribed. (Whether the initial form of the mass was a tilted block or not must be left undecided, because no sufficient account is given by the observer either as to the constitution or the form of the lower ground from which the range rises.) The crest is somewhat dissected but not deeply notched; the eastern flank is well dissected by consequent streams; the western flank is presumably more or less ravined by obsequent streams. On the whole, the stage of erosional development may be provisionally regarded as submature or mature.

It is tantalizing to read of the grassy benches at altitudes of 2,000 or 3,000 feet, and not to be told on which side of the range they occur, or how they are related to the structure of the mass; possibly they are granite benches on the western flank. One must discount the statement regarding the nearly vertical slope of the upper rocky walls, because vertical walls are altogether improbable if not impossible on the back slope, and are hardly possible even on the front slope of a monocline. Uncertainty must also remain regarding the piedmont terraces; perhaps they are remnants of a sandstone formation that once had a greater horizontal extension; but this cannot be determined because of the vagueness of the phrase: "On certain lower terraces, horizontal sandstones are deposited." Inasmuch as erosion is explicitly mentioned as having affected the crest of the range and implicitly suggested as having ravined the eastern flank, it is unfortunate that its effects on the western escarpment and around the base of the range are passed over in silence. Uneven description of this kind is disappointing.

The point to be emphasized is that the description prepared by the observer would be much more easily apprehended by the reader if it had been orderly instead of disorderly, and thorough instead of fragmentary. Immediately following the introductory statement concerning the occurrence of a high and isolated range, trending north to south, one must wish to know its general structure; namely, that it is a monocline of heavy sandstones, dipping eastward, with a foundation of granite exposed in the western flank. After explo-

ration is finished, the preparation of brief and explicit statement of this kind surely imposes no great burden on the observer; and as surely it gives great aid to the reader. Brief suggestion as to the initial form of the mass and as to the amount of change that it has suffered since its uplift would be helpful, because the reader could then, as it were, accompany the observer in his attempt to give an explanatory account of the present form. If erosion has gone so far that the initial form is altogether uncertain, an explicit statement to that effect should be made. Normal erosion being understood to be the process engaged in carving the mass to its present form, various details regarding the dissection of the crest, the steepness of the upper slopes, and the ravining of the flanks, may be easily added in the latter part of the description in orderly fashion; and as easily apprehended. If the observer, on seeing the ravines in the eastern flank, hesitates to call them "consequent," because of the vague possibility of some other origin, he may immediately solve this difficulty by calling them "apparently consequent;" and the reader will at once catch his meaning, and also his uncertainty regarding it. If the observer hesitates to assert definitely that the mass was initially a tilted block, he may say it looks "as if" it had been uplifted as a tilted block, provided that that is really his best interpretation of the facts; and then the reader will find in this guarded statement the clue that he needs in order to gain the observer's point of view, to follow the rest of the description, and to form a good mental picture of the landscape. The essential principles here are, first, that the reader's mental picture cannot be well formed, unless the observer describes what he has seen in terms that are susceptible of definite interpretation; and, second, that the mental picture cannot be easily formed, unless the observer presents the results of his observations in a reasonable order.

Only after a definite description of the landscape has been presented, is it fitting to mention by name subordinate items, such as single villages and individual streams. It is altogether inappropriate to use unknown local names of villages and streams as a means of locating unknown structures and forms. This is a general principle that is too often overlooked. In the absence of all diagrams and maps in the article here considered, the reader gains nothing on being told, before the direction of monoclinal dip is stated, that the foundation granite outcrops near the village of Blank. He profits nothing on reading that the sandstones are seen on the banks of River So-and-so, the relation of the river to the

range being unexplained, and even the direction of river flow being unmentioned. Such items may be useful hints to a second traveller on the ground, but they are distractingly irrelevant to a reader at a distance. On the other hand, after a general statement has been given, from which the reader may form a fairly definite conception of the structure and form of the range, it may well be added that at the western base, about so far from the well defined northern end of the range, and near a large exposure of the foundation granite, lies the village of Blank; or that at the head of a certain obsequent ravine, located in such and such a way and drained by the headwaters of River So-and-so, the sandstones are reached at such and such an altitude.

The Need of Systematic Methods

The article from which these extracts are taken affords a fair sample of the treatment accorded to land forms in most of the leading geographical journals of the world and in most of the books of travel, from which we must learn nearly all that we know about distant lands. If the article here abstracted departs from the average treatment of land forms, it is rather on the side of greater than of lesser fulness of statement; but here, as well as in the great majority of geographical books and essays, the method of treatment is really no method at all, as far as this division of our subject is concerned. Such articles as those by Bowman on the Bolivian Andes (*Amer. Journ. Science,* 1909) are altogether exceptional in the clearness and fulness of their explanatory treatment. There is very seldom any indication that explorers have had in mind any well matured plan or standard, in view of which a mountain range or any other form that they come upon, should be treated. Geographical essays seldom give us reason for thinking that their authors have had any thorough training in the analysis or the description of land forms; or for thinking that they are aware of the systematic association of parts that is so generally characteristic of the elements of a landscape, or of the reasonable origin of the associated parts by the action of ordinary processes. There is not even any clear indication that the observers are consciously experimenting with any definite method for the better presentation of the facts that they have seen. The random accounts of item after item are usually arranged in indiscriminate order, as if any accidental manner of presentation were all sufficient. This is truly one of the most disappointing features of the present status of geography. The very

sources from which we ought to expect the best material—namely, original narratives in books of travel, and essays in the journals of the great geographical societies—give us records of the kind just cited, in which so important a part of our subject as land forms is as a rule treated in an utterly unscientific manner.

The prevailing absence of scientific method for the treatment of land forms may be on the one hand taken as a discouragement by those who believe that a systematic method would be helpful; for if disorderly, unscientific methods prevail at so late a time as the present, it must be, one may be tempted to say, because none can be invented. But, on the other hand, the absence of method may be regarded as an encouragement, because it shows that the field is practically clear for the introduction of any method that will generally commend itself to practical geographers. The latter point of view is to be preferred. Let me, therefore, confidently urge upon all our members who are interested in this aspect of geographical progress to give a share of their time to the invention and development of a thorough-going method for the description of land forms, a method that may find general acceptance through being generally applicable; and to make experimental trial of the method for themselves, and explain it as well as exemplify it in their publications.

As an earnest of my conviction of the importance of this work, allow me to say that I have already made some experiments of this kind myself. You may remember that, two years ago, when we met at Chicago, I had the pleasure of conducting a conference in which the discussion centered chiefly on the possibility of developing and adopting a systematic method for the description of the lands, and in which I advocated the general use of what has been called the method of "structure, process and stage" for this purpose. It is my desire to-day to carry the subject of that conference somewhat farther; partly by reviewing what was then accomplished, partly by describing to you an experiment in the same direction that I made in Europe in the summer of 1908.

One of my objects at the Chicago conference was to bring forward various other systematic methods of treating land forms, besides the one with which I was experimenting myself; but no success was reached in this direction. Several members who were present, and several absent members to whom I afterwards wrote, expressed themselves as unprepared to adopt the method of structure, process and stage in their work; but what impressed me more was that they did not propose any alternative method. Perhaps no sufficient

opportunity was given for the presentation of such an alternative; but certainly none was forthcoming, either in discussion or in correspondence. Some members stated explicitly that they preferred to remain free from any limitations; and with such a preference for freedom I have the warmest sympathy. Indeed my wish to profit from the more general introduction of a systematic method does not, to my mind, unwisely interfere with such freedom. Improvements are always in order, and everyone must of course feel free to introduce them. There are occasions, however, when some definite method of treatment has to be adopted for a time at least, as when one writes a geographical description of a tract of country, or when one presents the principles of geography to a class of students; and still more when one attempts to teach young geographers the art of geographical description. It was particularly with regard to such needs that I was interested to learn the opinions and the practice of my associates. Perhaps the title of the Chicago conference, namely, "Uniformity of Method in Geographical Investigation and Instruction," went too far; and as I am now minded, my object would be better expressed under such a title as "Experiments in the Systematic Description of Land Forms." It is especially that aspect of the subject which I wish to pursue further to-day.

A Geographical Excursion in Italy

A good test of a method of description is found in its application to new fields. It was, therefore, with much interest that I looked forward two years ago to a journey to Italy in the summer of 1908, when it would be possible to revisit certain districts of which I had had passing glances in the spring of 1899, and to determine how far they could be described according to the method under experiment. But it occurred to me that an adequate and impartial experiment with a method could hardly be secured if the person who had developed it should also be the person who had to apply it. Others of different training ought to make the test. Hence a circular letter was sent out to a number of correspondents at home and abroad, indicating a route and a plan of work, and inviting them or such of their advanced students as they could recommend to join me in Italy on June first. The success of this plan passed all my anticipations. We were favored by special permission from the Italian Ministry of War, secured through the kind offices of the American Embassy at Rome, to make field studies even near fortifications and along the frontier. We were allowed to purchase all sorts of maps, not usually

on sale, at the Military Geographical Institute in Florence. We were cordially welcomed by scientific colleagues at various points. The members of the party all entered heartily into the spirit of the work proposed, and made a most harmonious even if variegated troop. The numbers varied from four to forty or more in different parts of the route. The cosmopolitan character of the gathering was its greatest value; for under what conditions could one secure livelier incentive to geographical investigation or make a better test of a proposed method of work, than by visiting choice fields in the company of earnest students of different nationalities and different training, and discussing together the varied landscapes that opened before us. Members who accompanied the party for a week or more included teachers from the Universities of Paris, Lyons, Marburg, Genoa, Michigan, Cincinnati and North Carolina, Williams College, and the Lyceum of Oran (Algiers), as well as graduates or students from Berlin, Lille, Vienna, Bern and Cambridge (England); those who were with us for shorter periods represented the Universities of Grenoble, Fribourg and Harvard, the military school of Fontainebleau, and the state normal schools at Salem, Mass., and Cheney, Wash.

Our work began on June first, 1908, at Ancona on the Adriatic (A, Fig. 1,), where we studied a late mature coastal plain; and ended on July 18 at Le Puy en Velay in central France; and between times we saw the valley of the Lamone above Faenza (Fa), in the northeast flank of the Apennines, the basins of Florence (F) and of Val d'Arno within the Apennines; the plain of Pisa (P); the beautiful coastal forms of the Riviera Levante between Spezia (Sa), and Genoa (G), the elbow of the Tanaro valley at Bra (B), where the river has been diverted from a former northward to its present eastward course; the lakes of Como (C), Lugano and Maggiore (M), and their associated Alpine valleys, where we discussed the problem of glacial erosion; the huge terminal moraines of Ivrea (Iv), and the glaciated valley of the Dora Baltea above them to Aosta (Ao); the pass of the Little St. Bernard, by which

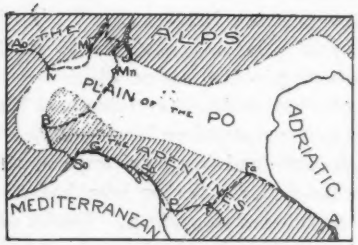


FIG. 1—Route of the Italian Excursion, 1908.

some of us crossed into France; the French Alps in the vicinity of Grenoble; and west of the Rhone the mountain belt of the Cévennes, formed by the dissection of the southeastern slope of the central plateau. It may well be imagined that we had much entertainment that was not strictly geographical; yet on the whole we held rather closely to the object of the excursion. One of the most amusing features of the journey was the necessity of using several languages in our daily intercourse; and here the European members of the party had great advantage over the Americans by their fluency in other tongues than their own. The determination taken by some of the American members to learn at least one foreign language before making another visit to Europe was not the least valuable lesson of our co-operative efforts.

The Method of Structure, Process and Stage

As in the case of the Chicago conference, the most significant result of the Italian excursion for me was again the prevailing absence among the members of the party of any conscious and matured method for the description of land forms. That the method with which I had been experimenting was not familiar to my European companions was surely not due to any recondite elements in it, for there are none; all its elements are taken from the common experience of geologists and physical geographers. In so far as the method has any novelty, it is to be found in the systematic treatment of well-known elements; and even in this respect it is not so novel as some have seemed to suppose. Its fundamental principles are to be found, for example, in the third edition of Sir Archibald Geikie's "Scenery of Scotland" (1901), where one may read:

"The problem of the origin of the scenery of any part of the earth's surface must obviously include a consideration of the following questions: (1) The nature of the materials out of which the scenery has been produced; (2) the influence which subterranean movements have had on these materials, as, for instance, in their fracture, displacement, plication, and metamorphism, and whether any evidence can be recovered as to the probable form which they assumed at the surface when they were first raised into land; (3) the nature and effect of the erosion which they have undergone since their upheaval; and (4) the geological periods within which the various processes have been at work, to the conjoint operation of which the origin of the scenery is to be ascribed" (p. 9, 10).

Here we have the very essence of what is implied under the terms

"structure, process and stage"; and I fully agree that "obviously," as used in the first sentence, is precisely the word with which to introduce what follows. Yet, obvious as these considerations are as regards the origin of scenery, it is seldom that they are completely and systematically employed by geographers in the description of scenery. Their helpful use is furthered by their systematic treatment according to a definite method; and therefore method has here a practiced value. Each member of my party knew well enough the various structures and processes involved in the production of natural landscapes, and could explain them item by item; nevertheless hardly any one had consciously adopted a particular method for presenting the results of his observations regarding the natural combinations of the items, such as occurred in the landscapes that were repeatedly spread before us.

A generally favorable consideration was given to the method of structure, process and stage, during the excursion, but this must not be taken as counting altogether in its favor. A definite method naturally makes headway as against indefinite, unformulated methods; and moreover, as I was the leader and oldest member of the party, my views probably received a greater consideration than they would have gained if I had been a junior and a follower. Still all allowances made, the excursion gave me great encouragement, and I resolved to persevere in carrying the development and the application of the method as far as possible; but always in the hopes of meeting other methods, developed by my colleagues; and always with the promise, to myself at least, to make careful trial of other methods as far as I could learn them.

The Dissected Coastal Plain Near Ancona

Let me give a few examples of our work, beginning with two excursions in the neighborhood of Ancona, where sheets 117, 118, 124, 125 of the Grande Carta topografica del Regno d'Italia, 1:100,000, served as local guides. Here the earliest members of the party, a Frenchman, a German Swiss and an Austro-Galician, were present. The results may be briefly summarized as follows: The northeastern Apennines serve as the oldland to a dissected coastal plain, some 20 or 30 kilometers in breadth, composed of unconsolidated strata of clay and sand. The dissection has been carried to a stage of late maturity by prevailingly consequent streams with short insequent branches, the largest consequents being those which have been extended across the plain from the Apennine oldland to the sea. The

oldland, although not sharply separated from the coastal plain, has a more deformed structure, a greater altitude, and a tendency to a longitudinal rather than to a transverse arrangement of its ridges. The relief of the district is moderate or small, with altitudes of 200 or 250 meters along its inner border, and of from 50 to 120 meters near the coast, where the sea has developed a fully mature line of cliffs which truncate all the sea-board hills in even alignment. The texture of dissection is rather coarse. In consequence of a slight and recent elevation, increasing from zero at the coast to 10 or 20

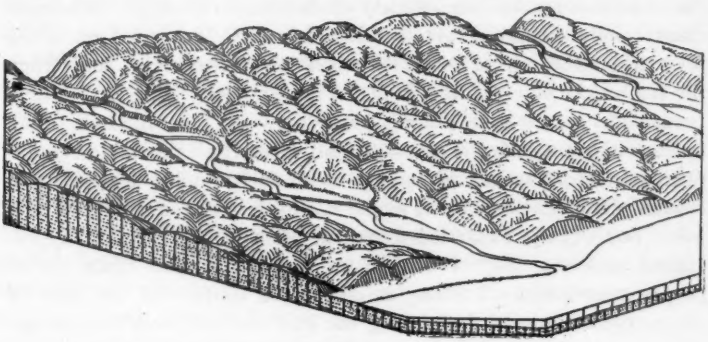


FIG. 2.

Diagram of the Late Mature Coastal Plain, South of Ancona, Italy; looking West.

meters at the inland border of the district, the larger consequent streams have excavated mature floods plains below the terraced remnants of their earlier valley floors; and during about the same recent period the sea has withdrawn from the maturely aligned cliffs of its former attack and prograded a strand-plain from 200 to 300 meters in breadth, which at the river mouths is broadened in faintly convex deltas of about double this measure. Hence it seems as if the recently revived rivers had rapidly washed so much waste to the sea, that the waves could not immediately dispose of all of it, and therefore deposited a part of it along the shore, thus prograding the strand plain. These features are graphically summarized in Fig. 2, an imagined bird's-eye view, looking northwest.

The essentials of the above description are, first, that it begins with a general statement from which the reader may immediately infer the total initial structure and form of the district concerned; second, that it proceeds, tacitly implying the action of normal and of marine processes of erosion, to state the stage that each of these

processes has reached in the regular progress of its work; and third, that it adds in closing a brief account of the result of a slight interruption of the first cycle of erosion due to a slanting uplift of small amount, and with the cautionary words, as if, provisionally suggests the correlated origin of two new features, the terraced valley floors, and the prograded strand plain, concerning which our brief excursions did not suffice to provide full proof.

Let us consider these points in more detail. From the term, coastal plain, which is given in the first sentence of the description, the initiated reader immediately understands a simple structural mass chiefly composed of stratified sediments, deposited on a sea floor when the region formerly stood lower than now, and when the sea had its shore on the flanks of the Apennine oldland; but now revealed as a land area, sloping gently seaward, in virtue of a broad uplift without significant deformation. Even if all this had been explicitly stated, instead of having been only implied in the term, coastal plain, the description would not have been too geological, for every point of the expanded statement bears helpfully on the appreciative understanding of the existing landscape, and hence on its proper description. Nothing is introduced simply for the sake of its geological interest, however great that may be; even the geological date of the strata concerned is left unmentioned, because this is geographically irrelevant.

It may be noted in passing that the terms, coastal plain and coast plain, have been used by some geographers to designate platforms of marine abrasion, now uplifted so as to form a littoral lowland. Geographical terminology is so little developed and systematized that no agreement as to the limitation of these and various other terms has yet been reached.

Although a marine coastal plain is in its earliest youth a smooth surface, gently inclining from the oldland to the sea, the first sentence of the description given above includes the significant word, dissected; and with this the reader must immediately pass from the conception of the initial stage of a smooth coastal plain to the later stage of a surface made uneven by the erosion of many valleys. The strata that form the plain are said to be unconsolidated, and this suffices to exclude all outcropping ledges from the present landscape, particularly as the dissection of the plain is said, in the second sentence, to have reached a late mature stage. All the hill slopes must therefore be conceived as cloaked with a creeping soil. The former shore line, marking the original inner border of the

plain must have lost whatever distinctness it may have had at the time of uplift; and it is indeed to-day hardly to be detected.

For similar reasons, all the streams must be conceived as having thoroughly well graded courses, and all but the smallest valleys must be pictured as having flood plains of gentle fall. The general pattern of the streams and their valleys is sufficiently indicated by the words, prevailingly consequent and short insequent. These must be taken to mean that the larger streams flow almost directly to the sea in sub-parallel courses about at right angles to the general trend of the plain as a whole; while many small vallley-heads branch in various directions from the trunk valleys. The hilly interfluves between the chief valleys must, in a late mature stage, be pictured as having lost something of their initial altitude, and hence, when looked at in the direction of the length of the plain, as no longer rising to a perfectly smooth and gently sloping skyline, but nevertheless as approximating to this form; while the spurs that branch from the axes of the interfluves must be pictured as generally pointing toward the sea and as descending by gentle, graceful, and well graded slopes into the open valleys. The texture of dissection being described as rather coarse, the hills and spurs must be conceived as having contour lines in flowing curves of rather large radius; and all close-set, sharp-cut ravines must be excluded.

At a late mature stage, the larger extended rivers must of course be pictured as having broad valley floors; and the sea must be imagined as having cut back or retrograded the front border of the plain, so that the coast-line hills are evenly truncated in a long succession of sea cliffs, all standing in accordant line over a well developed beach. Deltas must be absent. The general picture thus sketched must then be slightly modified by terracing the main valleys and by widening or prograding the beach into a well developed strandplain.

The technical terms here employed are few; most of them are almost self explanatory, but they are all highly significant. Consequent and insequent streams and valleys present elementary and fundamental conceptions in rational physiography. Retrogradation and progradation of a shore line by marine action correspond to degradation and aggradation of a valley floor by a stream; in both cases, the steady action of balanced forces is implied. Surely there can be no sufficient reason that the newly recognized ideas represented by these newly introduced terms should be neglected by modern geographers who employ, whenever they can, such innova-

tions as motor cars, film cameras and daylight developers. Nor need there be any fear that the mere use of such technical terms as are here suggested will necessarily result in enforcing an unattractive, non-literary style upon geographical descriptions. Attractiveness of style is a matter to be cultivated for and by itself; it is as well worth cultivating in geography as in history; but in neither subject should it involve a sacrifice of truth and efficiency to form and sound. The degree of technicality appropriate in a geographical description will depend largely on the condition of the readers for whom it is written. As the description here in discussion is intended for mature geographers, it does not seem to be either unduly technical or unattractively awkward.

It is assumed at the beginning of the description that Apennines and Adriatic are names that every mature geographical reader will know without explanation. No other local names are used in the general physiographic description. But now that the general features of the district have been presented, local names and all sorts of details may be conveniently added, and ontographic relations may be effectively introduced. For example, agricultural villages are found on the broader hills of the dissected interfluves, one of these being Loreto with its famous shrine, standing on a full-bodied spur crest some four kilometers back from the coast; here pilgrims would appear to yield a larger revenue than farms. Fishing villages lie on the harborless strandplain, especially near the mouths of the larger valleys; in bad weather their boats are hauled up on the beach or towed into the little rivers. An important trunk railroad and a main wagon road follow the level strandplain for a long distance; branch railroads enter some of the larger valleys, and wagon roads turn up all of them; while roads of less importance enter certain smaller valleys and sidle in zigzags up the spurs to the farming villages on the interfluve hills, or follow the hill crests in passing from one upland village to another. It may be pointed out that Ancona does not belong to the coastal plain; it lies on the northern side of a cliffed promontory of altogether different constitution.

The Valley of the Lamone

Our second stop was at Faenza, where the valley of the Lamone was examined. It is the work of one of the many streams that extend in apparently consequent fashion from the northeastern flanks of the Apennines across a piedmont lower land, to the fluviatile

plain of the Po, which here replaces the Adriatic sea. This late mature valley, enclosed by well dissected uplands of moderate relief, is of particular interest in having an early mature valley of small depth eroded in its floor: that is, we have here the late mature work of an earlier cycle followed by the early mature work of a later cycle; the earlier cycle having been interrupted and the later one introduced by a gentle uplift. I was greatly impressed by the distinctness of these combined features during the trip by rail from Faenza to Florence in 1899, and then resolved to examine them more at leisure at some later season. On going there in 1908 we were well rewarded by a delightful prospect over the valley from a favorable view point up on its western side, where our small party of four spent some profitable and memorable hours in the shade of a group of tall cypresses alongside of a little chapel, sketching, drawing maps and diagrams,

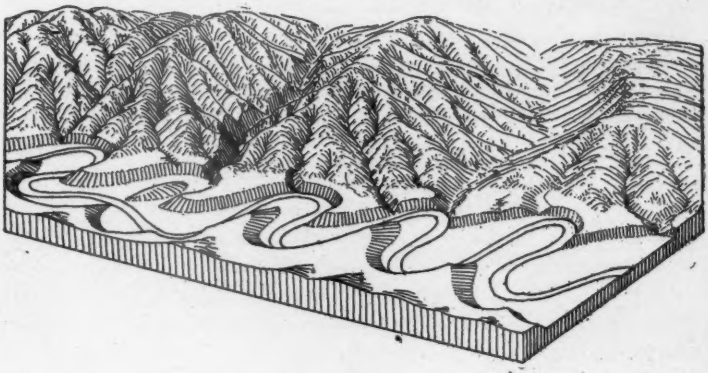


FIG. 3.

Diagram of the compound valley of the Lamone, Italy; looking West.

and discussing our efforts at systematic description. Then we walked over some of the neighboring hills, and in the afternoon went by train a short distance farther up the valley for new observations. The results are summarized in Fig. 3, an imagined bird's-eye view, looking northwest.

We thus learned that the valley traverses two piedmont belts of unlike constitution; an inner belt of deformed and somewhat resistant strata, which trend in general parallel to the extension of the mountains in the background; and an outer belt of weak, bedded clays, dipping gently northeastward. The inner belt seemed to represent the well degraded border of the Apennine oldland, with re-

spect to which the outer belt had been deposited; and the outer belt was apparently a continuation of the dissected coastal plain that we had seen by Ancona, here descending by straggling hills to the plain of the Po, instead of ending in an evenly retrograded line of sea cliffs. We noted first that in the inner belt of stronger strata the new, early mature valley, incised in the gravel covered floor of the former, late mature valley, has a well defined meandering course, with steep-walled amphitheaters in which the inclined strata of the district are well exposed, with sloping spurs sharply trimmed on their up-valley side, and with graceful flood-plain scrolls, systematically placed along the down-valley side of the trimmed spurs. The depth and breadth of the new valley both decrease up-stream, as if the work of the new cycle were less and less advanced as the mountains are entered. As might be expected, the small lateral streams that come down from the dissected uplands have as yet eroded only eroded narrow, young, steep-walled gorges, with abundant outcrops, beneath the soil-covered slopes of the mature lateral valleys of the earlier cycle; but the lateral gorges are already worn deep enough to mouthe at grade in the main valley. We noted secondly that, in the outer belt of weaker strata, all the features are farther advanced in erosional development, and that at the same time the depth of erosion decreases down-stream. The main valley of the first cycle was here widely opened; the main valley of the second cycle, originally a narrow, incised meandering valley, has now reached the stage of nearly consumed, blunted spurs, so that in this stretch the Lamone wanders freely on a flood plain of greater breadth than that of its meander belt. The valley sides of the lateral streams are here in large part already regraded with respect to the new depth that the valleys have gained; but in consequence of the faint northeastward dip of the weak clays, the higher part of the lateral valley sides are often incompletely graded on the northeastern or outcrop slope, and there exhibit a minute, bad-land dissection; while the southwestern or basset slope of the valley sides is smoothly sloping. As the hills decrease in height towards the plain of the Po, the height of the terrace remnants of the earlier valley floor over the newer valley also decreases; and the hills and the terraces vanish together at the border of the fluviatile plain. All this permits one to make a somewhat more definite statement regarding the uplift by which the first cycle of erosion was interrupted and the second introduced; namely, that the uplift seems to have been greater toward the mountains in the background than toward the

plain in the foreground; hence, that it apparently involved a gentle northeastward tilting, such as had been inferred near Ancona. But let it be added at once that the geographer's interest in these inferences as to past uplifts of the Apennines does not spring from any concern on his part as to past events as such, but goes only so far as past events may aid him in the appreciative observation and the effective description of existing land forms.

A railroad and a main highway follow the western terrace remnant of the earlier valley floor; hence they have to cross the newly incised side-valleys on embankments and bridges. I believe a few small villages lie on the broad floor of the newer valley in the outer belt of weak clays; but in the inner belt of stronger structures, all the villages are on the terrace; the newer valley being too narrow for occupation. On the western terrace near the junction of the two belts lies the village of Brisighella; it was by the chapel just above the village that we spent our morning hours, sketching and writing; and I can strongly recommend this spot as the goal of a physiographic pilgrimage for all who choose to follow.

Thus I might go on describing the smooth-floored basin of Florence, in contrast to the maturely dissected basin of Val d'Arno; the young lowland and its simple shoreline of elevation and progradation north of Leghorn, in contrast to the complicated mountainous shoreline of the Riviera Levante, with its interesting features due to slight and recent uplift towards Genoa, and corresponding depression towards Spezia; an account of this delightful district was presented to the research department of the Royal Geographical Society in March, 1909; it has since then been published in a paper on "The Systematic Description of Land Forms" (Geographical Journal, September, 1909, 300-318). Much might be said of the maturely established elbow of capture of the Tanaro at Bra; of the superb exhibitions of glacial erosion in the overdeepened troughs of the Alpine valleys, whose terminal basins hold Lakes Como and Maggiore, and of the remarkable pair of glacial distributaries by which the irregular intermediate basin of Lake Lugano was excavated; and so on. It was much to our regret that while the excursion was in the district of the sub-Alpine lakes, where the party had reached nearly a dozen, no member could from conviction present the arguments of the anti-glacial erosionists. We did the best we could in their absence, but found it impossible to explain the oversteepened trough walls and the numerous hanging lateral valleys of most typical development without accepting a strong measure for

glacial erosion. After crossing into France, two professors from the Universities of Grenoble and Fribourg presented their views against wholesale glacial erosion during a visit to the strongly glaciated valley of the Romanche; but it seemed to most of us that their discussion was incomplete and unconvincing.

What with the variety of landscape that we studied and with the variety of training represented in our cosmopolitan party, it will, I think, be agreed that our discussions as to methods of describing land forms must have been profitably extended by the time the excursion closed in the volcanic district of central France. Without giving further account of our results, let me next present certain underlying principles, which appear to me of much importance in this connection.

Description in Terms of Type Forms

Whenever an observer attempts to tell what he has seen, so that a landscape or a region may be conceived by his readers, he must describe the observed forms in terms of certain similar forms previously known to him, and hopefully known also to those for whom he writes. It must always be in terms of something previously known that a verbal description is phrased. Hence the most accurate verbal description will be made by that observer who is equipped with the largest variety of previously known type forms. It is important to consider how a young geographer is to obtain such an equipment. The ideally perfect method would be for him to travel about the world and see with his own eyes a great variety of actual forms, from which he might gradually develop a complete series of type forms. Then all other forms could afterwards be described in terms of these types. But this method is manifestly impossible of general application. Some equipment of types may be secured by observation of actual forms; and this beginning may be significantly enlarged by the study of descriptions, pictures, models, and maps of actual forms, as prepared by other observers.

The geographer who follows the empirical method stops here. The geographer who follows the explanatory method goes much farther. He extends and systematizes the equipment, thus far gained, by deducing many related forms; and thus fills his mind with a series of more or less ideal forms. It will then be chiefly in terms of the ideal types, largely developed by deduction, familiarized by diagrams, and confirmed or corrected by experience, that his explanatory descriptions of actual landscapes will be phrased. But

whether the geographer follow the empirical or the rational method, it will be only in proportion to the completeness with which his series of ideal forms provides him with counterparts of actual forms, that his descriptions of actual landscapes can be true to nature. Only in proportion to the compactness of the terminology in which the ideal forms are verbally expressed, can the observer's descriptions be tersely stated. Only in proportion to the correspondence existing between the ideal forms as conceived and named by the observer and by his reader, will the reader be able to apprehend the observer's meaning.

Imagine, for a moment that the observer had no mental conception corresponding to what is commonly understood by the word, hill. He would then have to fall back on geometrical terms, such as apex, slope, base, and so on, in order to give an account of a hill when he sees one; and his account would involve awkwardly long paraphrases. Or imagine that when the observer writes down the term, hill, the reader conceives the form that we usually mean by the term, hollow. The reader might mentally conceive a very definite landscape; but it would have little relation to the landscape that the observer had seen.

Contrasts of Empirical and Explanatory Methods

Let me contrast somewhat further the empirical and the rational use of type forms. In so far as ideal forms or types, with their corresponding terms, are learned partly from direct observation, partly from books and maps and pictures, they may be treated either empirically or rationally. If treated empirically, each type form, however learned by the student, must have been derived from someone's observational experience, without explanatory interpretation. If treated in the explanatory fashion, all the members of the series that are based on induction should be rationally or genetically accounted for as far as possible; while many other members, developed by deduction, will be perfectly understood, even though they are purely imaginary. Under the empirical method, diagrams are unsafe if they depart from the forms of nature, for their departures can hardly be reasonable under a method from which reason is excluded. In support of this strong statement, one need only turn to those fanciful not to say fantastic landscapes, which have so often defaced the pages of empirical text books, and which bring together in the most absurd manner all sorts of incongruous land forms. Under the rational method, diagrams and especially block-

diagrams, of which more will be said below, are of immense service; they present the graphic equivalent of deduced forms, whereby another person than the deducer may easily apprehend the intended meaning; and they serve at the same time as graphic definitions of a systematic terminology.

Furthermore, each member of the empirical series must be learned without consideration of its origin and without explanation of its relation to other forms. Hence to the geographer who employs the empirical series, the corresponding actual forms in a landscape will seem to stand in purely arbitrary association with one another; the occurrence of one element of form cannot be logically taken to indicate the associated occurrence of another element; the use of empirical types in the description of actual landscapes or regions requires that every part must be described for itself. On the other hand, all the types in an explanatory series, and particularly the deduced types, are learned in view of their origin by the action of some reasonable process on some specified structure through some limited period of time; and hence type-forms of this kind are necessarily considered in relation to their natural associates. The association may be regional, as in the case of the different parts of an ideal landscape produced by the imaginary action of process on structure to a given stage of development; or the association may be sequential, as in the case of a single element of form followed in imagination through its successive stages of erosional change, from the initial, past the sequential to the ultimate.

As a further contrast, all the many members of an extended empirical series of ideal types must be learned arbitrarily and separately, for no mnemonic aid from explanation attaches to any of them. All the members of an extended explanatory series may be divided into groups, so that the groups themselves shall have certain highly suggestive general relationships, and so that the members of each group shall be regarded as systematically interdependent and easily remembered. The development of the explanatory series is immensely aided by the mental process of deduction, which may be carried on by a trained student anywhere and at any time at his convenience; but deduction has no significant place in the preparation of the empirical series, each member of which must originally be learned by some observer travelling about in the actual world.

Having now pointed out the strong contrasts between these two kinds of type forms, in terms of which the descriptions of natural landscapes and regions must be made, let me hasten to state that

no one to-day uses either kind in its purity. The most conservative empiricist will introduce some explanatory types and terms in connection with forms of which the origin is manifest, such as sand dunes, deltas, volcanoes, and sea cliffs; while the most determined rationalist will not infrequently find certain actual features which he cannot explain, and for which he can therefore establish no corresponding explanatory types. The difference between the empiricist and the rationalist is therefore not so much in their practice as in their intention. The empiricist introduces explanatory terms as it were by accident; he makes no conscious effort to substitute explanatory types for empirical types, and he has no definite intention of introducing explanation as the most effective means of description. The rationalist, on the other hand, consciously and intentionally strives to find out the origin of every form that he observes, and then tries to describe every observed form systematically in terms of deductively developed type forms. The conservative empiricist condemns the bold rationalist as using a dangerous method, in that it must often be unsafe to describe what one sees in terms of what one does not and cannot see; and in that it is unwisely venturesome to introduce theoretical considerations, which are in many cases necessarily more or less doubtful, instead of holding to direct observation which is essentially safe. The venturesome rationalist criticizes the hesitating empiricist as using a blind method, in that it is short-sighted to describe only those things which can be seen with the outer eyes, and unreasonable to omit all those illuminating explanatory considerations, theoretical though they be, by which so much light is thrown on empirical facts, and by which the way is indicated to many facts which the empiricist overlooks.

My own preference for the explanatory method is so strong that the preceding paragraphs have probably done some injustice to the empirical method. Be this as it may, it seems to me a plain duty to use to the utmost every explanatory relation that we can discover, in so far as it aids us in describing existing landscapes. If the explanation seems assured, it may be used without qualification; if it appears somewhat venturesome, explicit notice may be given of its insecurity by introducing warning words; for example, "as if." The extraordinary advances made in the understanding of the evolution of land forms in the last half century, particularly those advances made by our government geological surveyors in the arid southwestern part of our country, cannot be neglected by the geographers of this new century. The only matter that is questionable

is the manner in which the advances shall be practically applied in geographical investigation.

Geology, as Such, to be Avoided in Geographical Descriptions

The influence of geology upon geography has indeed been so great that it has come to be a common practice to introduce some statement of geological history, as if in explanation of the origin of land forms, so as to aid in their description; but if geological history is introduced in a more or less haphazard way, it often goes too far in taking the attention away from the geographical present and holding it too long on the irrelevant past; and it often does not go far enough in the way of emphasizing the origin of visible forms. The accidental geological explanation is moreover especially deficient in not developing a carefully extended series of deductive types, in terms of which existing forms may be presented. In some way or other such a series of types certainly ought to be developed and carried in the mind as an indispensable equipment for outdoor observation and description. The way that has been most convenient, effective and helpful in my experience is the one embodied in the method to which I have given the name "structure, process and stage," and of which some illustration has been afforded by the examples presented above from my Italian excursion.

The Scale of Verbal Description

There are certain supplementary considerations regarding the description of land forms to which brief attention may be given. The first concerns what may be called the scale of verbal description, and corresponds to what we familiarly understand by the scale of a map. The well-trained cartographer has had conscious practice in the reduction of large-scale maps to small scale, and knows that in so doing he must intelligently and critically select the major features for retention and the minor features for omission; he knows also that a really good small-scale map can be made only by reducing it from a well prepared map of larger scale. What I wish to point out here is that the principle of large and small scales may be applied not only to maps, but to verbal descriptions as well. The kind of maps here considered are not those sketch maps of hasty route surveys, in which large spaces are necessarily left blanks; these would correspond to the verbal reports of hurried excursions, in which the writer is well aware that his records are deficient in many respects. It is here a question of more thorough work; that is, of

maps for which all necessary surveys have been made, and of descriptions for which all necessary studies have been completed. Then, just as a cartographer must intelligently select certain features to be retained in reducing a large scale map to a smaller scale, so a geographer, who has already gained sufficient information about a district to complete an elaborate or large-scale description of it, must critically select the major features for retention and the minor features for omission, in compressing his account to the space of small-scale presentation.

In view of this principle, the geographer who wishes to make a well-considered, brief statement concerning a district or region must first learn a good deal more about it than can be contained in a little space. He must then intelligently and critically select the major features for retention and the minor features for omission. He must furthermore carefully study the capacity and the limitations of verbal description, and thus come to perceive that his task in setting forth the features of a district in words is altogether different from that of the cartographer in setting forth the facts graphically. Cartographic representation permits, and indeed requires, the indication of every element of form that is reached by its scale, and gives to each element a definite location and dimension. Hence the cartographic representation of geographical features is very definite. The eye, when first looking over a map, glances from part to part, and apprehends chiefly those elements which by repeated occurrence give character to the district, and those which by reason of exceptional pecularities stand forth from the others; afterwards, special parts of the map may be more closely examined. On the other hand, verbal description can hardly be understood unless the reader follows the order of presentation chosen by the writer. The description will be fatiguing if it attempts to state the location and size of every element of form; it is therefore best employed to state the generalized characteristics which the eye would perceive in looking over a map, thus giving first emphasis to prevailing features, and only secondary emphasis to less important special features. After the leading facts are thus presented, more elaborate description may well follow, with due attention to what may be called "local color."

Inasmuch as verbal presentation is necessarily linear, one item following another, emphasis is automatically given to those which come first; subordinate rank is indicated for such items as are assigned a later place; but on a map there is no beginning or end; the whole surface is presented simultaneously, and the student may

first take up any part he pleases. If any one wishes to learn minute details as to the length or direction of certain small streams, the location and altitude of hills, and so on, he can best find them on a map; but if he wants a well-phrased characterization of a district, he will be best helped by a verbal description, on a scale appropriate to the occasion. Hence the importance of giving conscious practice to the preparation of verbal descriptions of a given district or region on different scales; one might be ten lines long; another, might fill a page; a third, a chapter; a fourth, a volume. A geographer who proposes to make himself proficient in his science ought to practice himself as thoroughly in descriptions on different verbal scales as in drawing maps on different graphic scales.

The Style of Verbal Description

Maps differ in style as well as in scale. A wall map on a given scale is coarse-textured, so that certain leading features may be seen across a room. A map of the same region, and on the same scale, divided into sheets and bound in an atlas for library use, is crowded with minute details of fine texture. So verbal descriptions may vary in style as well as in scale. For example: the first account of the dissected coastal plain on the Adriatic border of Italy may be regarded as of medium scale and of technical style; the several following paragraphs, in which the same ideas are presented in more general language, is on larger scale, so far as space is concerned, but as it is of popular rather than of technical style, it really adds no new facts, nothing but ease of apprehension to the smaller scale description; hence it may be compared to a wall map, in being offered to ready understanding. On the other hand, if the increased space had been given to a continuation of the technical description for the purpose of bringing in many details, the larger scale of description might then be compared to a larger scale of a map for library use, in which many small features are indicated. Hence style as well as scale requires consideration; and in acquiring the art of geographical description, conscious experiment and practice should be given to various styles as well as to various scales.

From all this it must appear clearly enough that the preparation of an effective verbal description, after all necessary field studies have been made, will require the careful consideration of several different points. The style to be adopted should be first determined according to whether the description shall be technical, for trained geographers, or popular, for intelligent, mature, non-technical readers.

Second, consideration must be given to the scale or space permissible, according to the opportunity for publication, and to the relation which the description bears to the rest of the volume in which it may be only a part. In view of the style and the scale as thus determined, the critical selection of certain items to be included and of others to be excluded may come next; and with this should go the careful determination of the order in which the included items shall be presented. It has already been shown that various items concerning location, dimension, attitude and direction of subordinate features had best be omitted from verbal descriptions, they have their better place on a map; if included even in a large-scale verbal description of technical style, they will make it unreadable. It is chiefly the generalized treatment of dominant or of recurrent elements that deserve verbal statement; with subordinate place for the more significant exceptional features.

The Order of Presentation

As to order of presentation, a whole essay might be written. I shall here emphasize only certain leading principles. The first is, to present the main idea in the first sentence; to give at once, at the very outset, a general block-statement for the district concerned. The reader will then most promptly apprehend its general nature, most easily follow the explanatory paragraphs as they are expanded, and most readily appreciate subordinate features, item by item, as they are introduced in orderly advance. The case is utterly different from that of a novel or a play, in which it is appropriate enough to conceal the plot till the end is approached; here the reader or listener enjoys being kept in the dark while the story is developed. But in a scientific essay, the reader ought, contrary to common practice, to be made aware of the end at the beginning, particularly if the explanatory method of description is employed; so that as the description advances, the leading explanatory ideas as stated in the first paragraph may be constantly confronted with the evidence that bears upon them, and so that the smaller features may be immediately placed in their proper position with respect to the general scheme. Narrative descriptions, in which items are presented in the order of encounter in the field, may be appropriate as a means of recording the work of hasty reconnoissances, but when the narrative method is employed in the presentation of more careful studies, the most that can be said of it is that, as far as scientific geography is concerned, it is a very unambitious method.

It has already been pointed out that the location of natural features should not be indicated by means of their relation to small artificial features, such as little villages, which must be unknown to most readers; but on the contrary, that small articifical features, such as little villages, ought to be located in relation to the previously described natural features, to which they stand in some reasonable relation. This principle should surely be carried out by those who believe that the location of articificial features exhibits some response to physiographic environment. Likewise, an individual hill or stream should not be first indicated by its name, which is the least natural thing about it, and which is unknown to the reader and therefore of no assistance to him in his reading. Such features should be introduced in general terms, by describing the whole group of features to which they belong, and then singling out such members of the group for location and name as may be desired.

It is of prime importance to the writer to test his own description as he prepares it; to determine whether his manner of announcing the most general features is thoroughly effective; whether the order in which he introduces secondary and tertiary items is the most appropriate. Practice added to close scrutiny can alone develop proficiency. On the other hand, when a carefully prepared description reaches the reader, he must exercise a considerable degree of attention and skill, in order to apprehend the full significance of the writer's terse phrases; and he must use a skilful imagination in the process of visualizing the forms, large and small, as they are introduced by the writer. Here again, nothing but practice can produce proficiency; and all this suggests that the training of a would-be geographer ought to include conscious, well-planned exercises in all these processes of observing, generalizing, writing, reading, and visualizing, just as surely as it should include exercises in surveying and map-drawing.

Graphic Aids in Geographical Description

The best geographical descriptions fall short of satisfying the reader if they are purely verbal; they ought to be supplemented by graphic devices wherever possible. A small scale map may be introduced to great advantage on an early page, in order to exhibit general locations; hence, well known as Italy may be, the places above mentioned in connection with my Italian excursion are probably identified more easily and more promptly than they would be otherwise, by means of the outline map, Fig. 1, prepared in an

hour, here reduced to half scale, on which our route may be followed and on which the Ancona district and the valley of the Lamone, above Faenza, may be quickly found. A larger scale map, if available, may be appropriately provided to accompany more detailed descriptions; a good purpose is served in this respect by the elaborate sheets of the Italian topographical map, 1:100,000, already mentioned, which clearly exhibit the mature dissection and the even truncation of the coastal plain, south of Ancona, and the strand plain by which the former sea cliffs are now separated from the shore line. Photographs and sketches serve to illuminate the text; but in recent years photographs have been rather recklessly used, particularly when they are printed in a very blurred condition on rough paper. Sketches are in many cases more serviceable, even though less accurate, than photographs, because they show what the observer wishes them to show. As a subordinate matter, let me add in this connection certain details that are often overlooked, if one may judge by many illustrations in scientific journals. First, the size of the page on which a figure is to be printed ought to be learned before the figure is drawn. Decision should then be made as to whether the figure shall occupy the whole breadth of the page or only half-breadth; and to do this it is worth while to sketch the figure roughly on the scale that it will have in the text. When this is settled, the figure should be redrawn on double scale with really black ink in smooth firm lines, so that it may be effectively reduced in making a black and white "process" cut. If any lettering is included, let the letters be plain and unshaded; and let them be large enough, so that when reduced they are easily read. The number and title of the figure ought not to be drawn on it or below it; both can be set up in type, when the figure is printed in its proper place in the text, thus saving in time and gaining in appearance. These are trifles: but trifles ought to be properly attended to, and not neglected.

In addition to the various cartographic and pictorial aids thus far mentioned, let me call special attention to the device known as block diagrams, or bird's-eye views, such as Figs. 2 and 3, which may be designed so as to form useful supplements to descriptions that open with condensed block statements. Both tell the plot of the whole story at the beginning, and thus allow the reader to place all details where they belong, when they are met in later paragraphs. Just as block diagrams aid in giving graphic illustration to the members of series of deduced type forms, as has already been mentioned, so they aid in the understanding the description of actual regions,

because they serve so immediately to present the generalized type forms with which the observer compares the actual forms. When seen corner-wise, block diagrams have the advantage of presenting two structural sections, if desired, in immediate association with the surface forms that have been carved on the structural mass. When drawn in groups, they have the further advantage of compressing into a single view the several successive stages of development, which are verbally presented or implied in the statement of the text.

Diagrams of this kind are not and are not meant to be mere pictures of observed landscapes, for they must always be simplified by the judicious omission of much unessential detail, and greatly compressed by the omission of many repetitions of similar elements. They should be simply drawn so as not to demand too much time in preparation, yet they may still be vivid and effective in aiding the reader to grasp the meaning of the writer.

No one may be more conscious of the defects of diagrams than the one who has drawn them. In the fancy view of the dissected coastal plain south of Ancona, here given in Fig. 2, the hill shading is very rough; all the slopes are drawn convex, and hence fail to show the graceful concave lower sweep down to the valley floors. The terraces in the main valleys and the narrow belt of oldland included in the background are too definite and distinct. The absence of all indications of forests and fields, of villages and roads, gives an impression of barrenness and vacancy that does no justice to the pleasing reality. Moreover, the dissected hills and the broad valleys of two extended consequent streams from the oldland do not correspond to any particular hills and valleys of the district concerned; they merely show the observer's generalized idea of the kinds of hills and valleys that characterize the district. Nevertheless the drawing has a value in immediately presenting the essential features of a late maturely dissected plain, in which the streams and valleys are prevailing consequent, with some insequent branches; in which the hill sides are all reduced to gently graded slopes; and in which the spurs in the foreground are all evenly truncated by the former sea cliff, in front of which the strand plain is now prograded.

Similarly the fancy sketch given in Fig. 3 shows only the kinds of features that were noted in the valley of the Lamone:—the maturely dissected hills developed on the more resistant structures that occupy the middle and left of the view; the incised meandering valley of the second cycle, maturely opened beneath the floor of the

broader, late mature valley of the first cycle; the sharp-cut side gorge through the hills of harder structure in the left-center, in contrast to the wider side valley on the right, where the weaker clays of the dissected coastal plain replace the more resistant strata of the Apennine foot hills; and in immediate association therewith the greatly broadened floor of the main stream after it passes from the more resistant into the less resistant structures. The diagram would surely be much more faithful, if it had been drawn from a hilltop on the near side of the valley instead of from the imagination of what such a hilltop view would be. Many of the lines would be smoother and steadier, if they had been drawn by a professional draftsman; but diagrams prepared by some one else than the observer are hardly more satisfactory than lectures prepared by an expert type-writer instead of by the lecturer himself.

Block diagrams are more immediately understood than maps are; they are vastly superior to mere profiles, which of all graphic devices are of least value to the geographer; for he is concerned with surfaces, not with lines; yet if profiles are wanted, they are found along the side of block diagrams, in their proper position with respect to the adjoining surface. For the purpose here indicated—that of giving an immediate introduction to the whole story—block diagrams are as much more serviceable than photographs, as photographs are more serviceable than block diagrams when it comes, later, to the presentation of details. One of the chief values of block diagrams remains to be mentioned; they can be drawn from any desired point of view, as in the case of Figs. 2 and 3, so as to show the features represented in the best possible relation to each other. Some ingenuity in the way of inventing and designing is here called for; and it is well expended if the final diagram is thereby drawn in the most effective manner.

An objection that is often raised against the use of block diagrams—that their preparation demands a knowledge of drawing—ought to have small weight among practical geographers, especially among the younger ones. To object to an effective kind of diagrams because their preparation demands a moderate skill in drawing, is like objecting to horseback riding during a geographical excursion in the West because it involves a little skill in the saddle; or to the use of original photographs as illustrations, because their preparation requires a little acquaintance with cameras and films; or to the consultation of European journals, because this calls for a moderate knowledge of foreign languages; or to map-making, be-

cause it depends on an elementary understanding of cartography; or to preparing a written report, because it involves a knowledge of composition. There must of course always be a great difference in the proficiency that different geographers will reach in these several associated arts; but any one who is in earnest in his work may soon acquire a profitable reading knowledge of a foreign language or two, or a sufficient comfort in horseback travel, or a simple proficiency in photography, or a reasonable expertness in writing reports on various scales and in various styles, and also a helpful handiness in drawing diagrams. The only serious point here to be settled by a practical geographer is: are diagrams, foreign languages, photography, and riding, and so on, really helpful in the kind of work that he proposes to undertake; if they are, then he will as a matter of course set about acquiring some degree of skill in each and all of them.

Objections to the Method of Structure, Process and Stage

Allow me briefly to consider some of the objections that have been urged against the method of structure, process and stage in the description of land forms. A German geographer has regarded that part of the method which involves the scheme of the cycle of erosion as too rigid, and has likened its use in the description of natural landscapes to the cramping of nature in a strait-jacket. Such a criticism only indicates the complete failure of the critic to apprehend the method; for it is essentially elastic and adaptable; much more so, I believe, than any other method of description that has been formulated.

Some other critics have regarded the method as too geological, because it requires the consideration of underground structures and of past processes. This it certainly does require; nevertheless it introduces underground structures only so far as they aid in the appreciation of visible surface forms; and it introduces past processes only in so far as they aid in the explanatory description of actual surface features. In this respect, it is interesting to note that, judging by my experience in Germany last winter (1908-'09), the method of structure, process and stage is much less geological than the method of geographical description commonly employed by the younger geographers at the University of Berlin; for they habitually presented past geological conditions and processes as such, and treated them as characteristic parts of geographical reports, even though the events thus brought in from the past bore in no direct or

helpful way on the features of the present. Many interesting discussions were held on this point, always with the object of trying to emphasize the existing visible landscape as the object of a geographer's work, and hence with the wish to exclude every geological item, however interesting in itself, if it had no helpful bearing on the observable facts of to-day. For example, I questioned the value of the geological term, Triassic, in the account of a certain district in Hesse; my contention being that all a geographer's needs were satisfied when the composition, structure, thickness and attitude of the formation concerned were stated, without regard to its date; but German geographers seemed to be in favor of including the names of geological formations in geographical descriptions. The geologist of course wishes to know the date of origin, as well as the present structure and attitude of the formations that make up a district; but the geographer has little or no need of such historical information, although it is extremely important for him to know to what stage of erosion the district concerned has advanced in one or in several successive partial cycles. However, this is a subordinate matter.

An English geographer has expressed some doubt as to whether the method of structure, process and stage, which he recognizes to be of value for the description of small districts, will prove serviceable for the description of large regions. My own opinion on this point is that its value for large regions can only be determined by experiment, which I should like very much to see tried. In any case, we can gain no comprehension of large regions save by gathering and by generalizing observations of small visible landscapes. It is fair to expect that the better our understanding of detailed morphology, the better we can summarize general feaures. My own experience in describing the larger subdivisions of the United States and of Europe would encourage me to say that the explanatory method can be well used for the treatment of such areas; but I have made few systematic experiments with any other method of description.

Another geographer has expressed his fear that an explanatory method of description for land forms will prove dangerous in the hands of untrained students, and that young disciples may apply it in a way that will cause anxiety at first and horror afterwards. Horror is rather a strong word to use in this connection; but I can instance several examples that have caused me some anxiety, and others which have, I am sorry to admit, shocked me to say the least.

There is the case, for example, of a geographer who, inasmuch as he submitted an article to me for criticism, may perhaps be regarded as a disciple to a small extent; but surely he caused me some anxiety by stating in essence that "granitic districts are of rugged form." His evident error here was the failure to consider the erosional process and the time element, or stage of erosional development, in his partly explanatory treatment; for resistant as granite is, rugged as its forms may be in a youthful stage of normal erosion, and sharp as they may be in a mature stage of glacial erosion, granite must have subdued and rounded forms in late maturity; and like every other kind of rock, even the hardest granite must be worn down to low relief of very tame expression in old age, as abundant examples testify.

In another case a geographer who explicitly declared himself to be my disciple shocked me by the additional declaration that the scheme of the cycle of erosion, which is essentially involved in the method of structure, process and stage, must be inapplicable to districts in which frequent movements have taken place, because forsooth he thought that the scheme of the cycle could be used only where complete cycles ran their course! In both these cases and in various others of a similar kind, criticism ought not to be directed against the explanatory method of description, but against its wrong use. It is proverbial that "a little learning is a dangerous thing"; the proper guard against such danger is better found by decreasing the careless use of an explanatory method, rather than by discouraging its careful development.

And finally, to close these comments with one that suggests a most peculiar attitude on the part of the critic, it has been objected that the method of structure, process and stage cannot be applied until one knows all about the district that he is describing. In so far as the use of the method may require an observer to make a serious study of a district before he attempts to tell about it, the method is thereby recommended; but as a matter of actual experience, the explanatory method has proved useful even in the most hasty reconnoisance, because it aids so greatly in directing observation to significant points, which might as likely as not escape the attention of a blind empiricist.

The kind of criticism that the method of structure, process and stage really needs is, as has already been intimidated, criticism based on the experimental and comparative use of various methods, each method being first carefully thought out, and then all the methods

being thoroughly and impartially applied to one and the same district. Experiment of this kind should of course be made by various observers of different trainings and preferences, and in different localities. Precisely this sort of experimental criticism was attempted during the Italian excursion of 1908, but under conditions, as already pointed out, that predisposed the jurors to a verdict in favor of a particular method. It would be a good thing for geographical progress if a larger experiment of the same kind could be made. I trust that our Association may some day actively engage in such an enterprise.

THE NEW BOUNDARY BETWEEN BOLIVIA AND PERU

(Map opposite p. 436.)

Another of the boundary disputes which, from time to time, have severally strained, if not dissolved, the friendly relations between various South American countries, has at last been settled. A number of maps drawn to show the new boundary between Bolivia and Peru, according to the treaty of La Paz, signed on Sept. 17 last, were prepared before the exact wording of the treaty had been received in Europe and are therefore not entirely accurate. The accompanying map, prepared for the *Bulletin,* has been compiled in accordance with the letter of the treaty, and with the aid of official map material supplied by the Consul General of Bolivia in New York and other data used to present the geographical features of the region as accurately as can be done in the present state of the surveys.

One of the red symbols shows the southern boundary of Brazil, in this region, according to the treaty of Petropolis. It will be remembered that a considerable number of Brazilian rubber collectors and others who had settled in the basin of the Rio Acre, attempted to establish the Republic of Acre in 1902, an act that Bolivia resented, for she claimed, though she did not adequately control, this remote district. Out of this trouble, there was finally evolved the treaty of Petropolis under which Bolivia ceded about 27,500 square miles of the Acre region to Brazil in return for $10,000,000 and some other considerations. Major P. H. Fawcett was engaged to delimit this new boundary, in behalf of Bolivia. He began the work in 1906

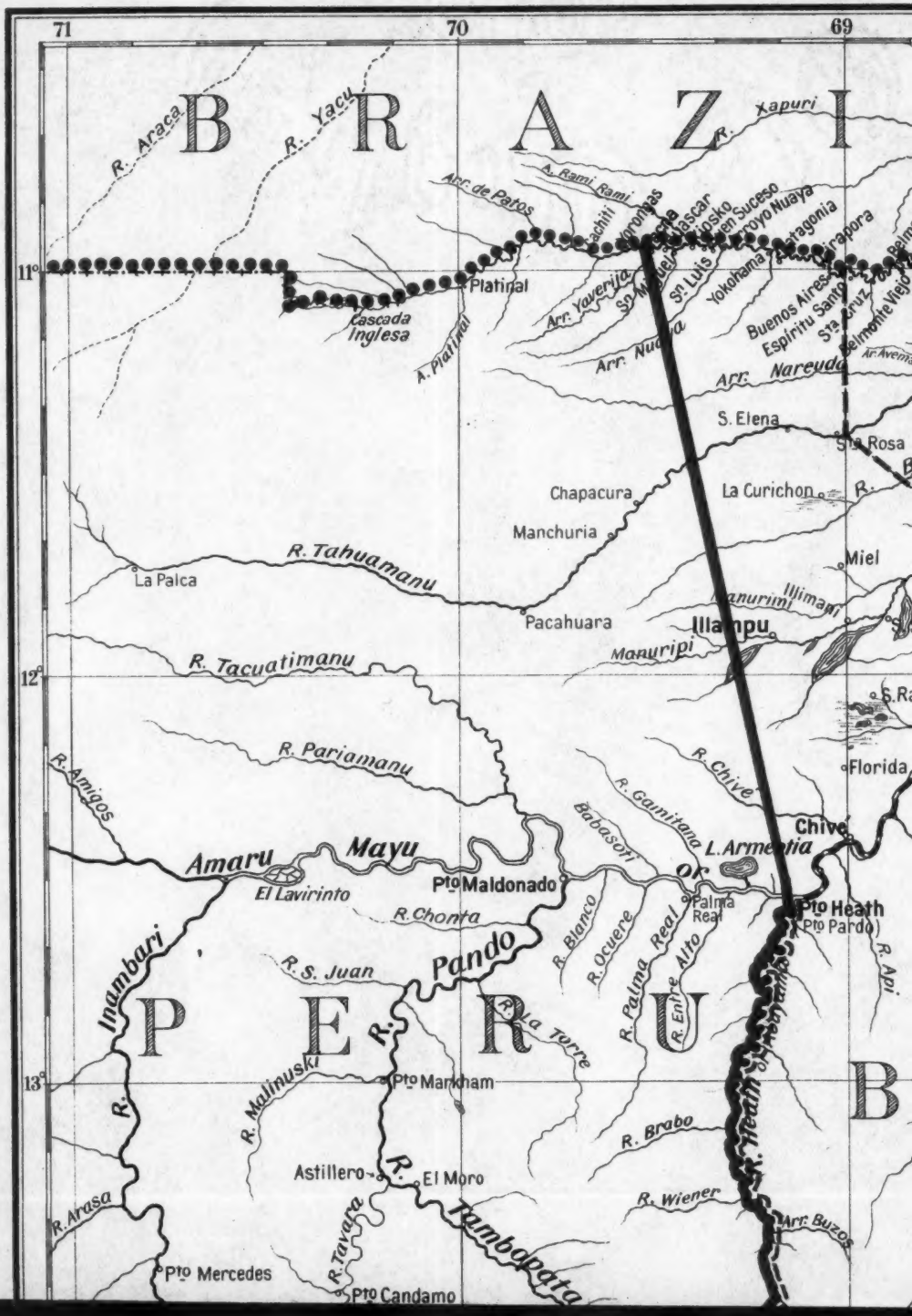
and his incidental explorations and the formidable obstacles he encountered are described by him in the *Geographical Journal* for May, 1910.

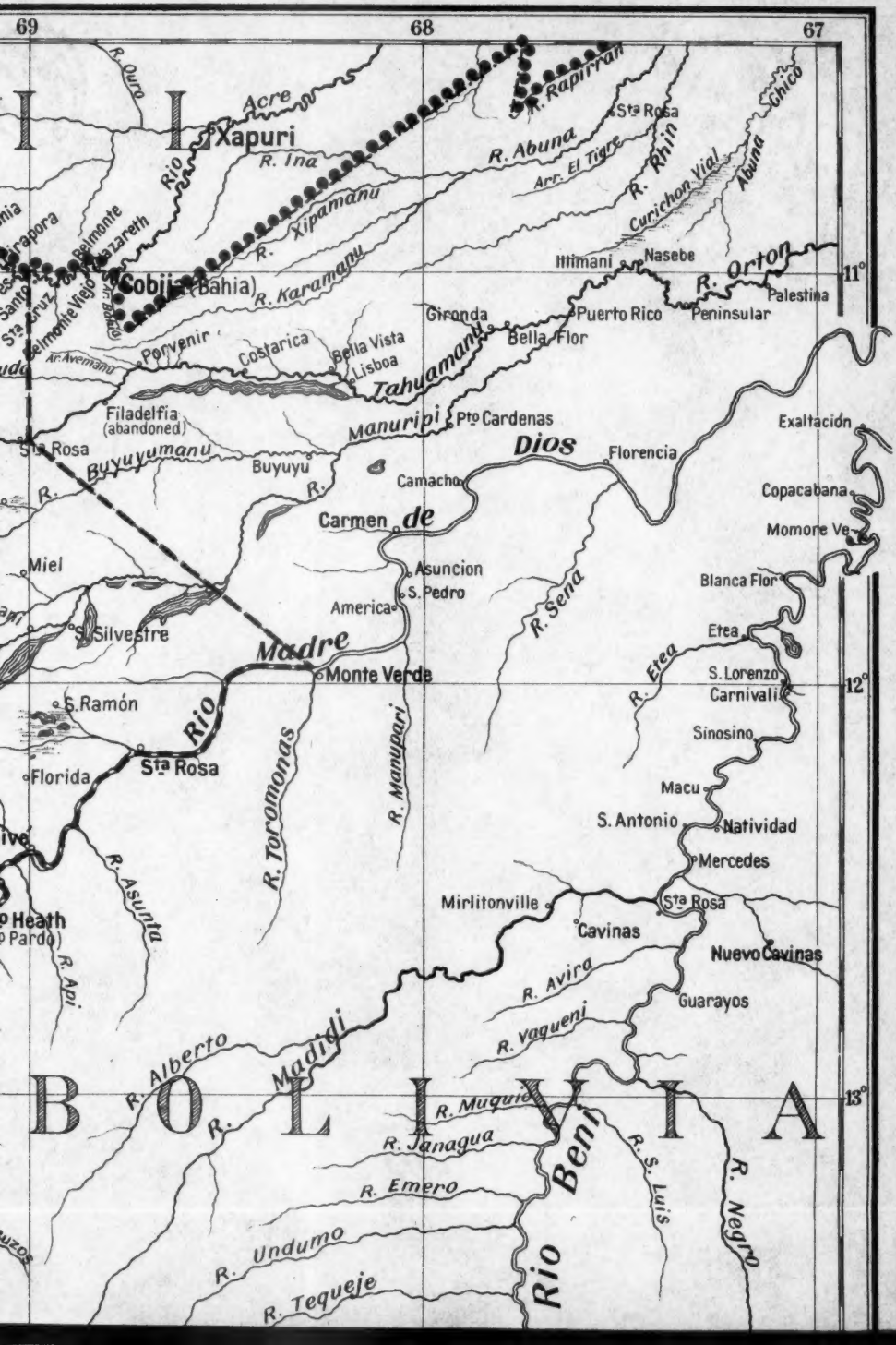
Bolivia's boundary disputes with Brazil were at length out of the way but there remained serious differences with Peru concerning their frontier. The Argentine Government was agreed upon as the arbitrator of this dispute and the Argentine President announced the decision of the Commission, in July last year. Our map shows the line which was thus proposed as the boundary between the two countries.

But Bolivia declined to accept the boundary thus marked out. She contended that the Argentine Commission had not taken the time necessary for a careful examination of the arguments of the disputing nations. It was asserted that historical facts had been ignored and that a large area which Bolivia had discovered, and partly explored, in which she had established industrial enterprises and which she had officially occupied along the rivers Inambari, Tambopata and Heath was, according to the Argentine arbitration, to be turned over to Peru. Bolivia declined to accept the suggestion of the Argentine Commission which she recognized only as having advisory relations concerning the controversy between the two powers. The reasons why Bolivia declined to accept the Argentine arbitration were set forth in English by Señor B. Saavedra, Legal Adviser for Bolivia in the arbitration, and printed by the government at La Paz under the title of "The Argentine Award."

Negotiations were immediately opened between Peru and Bolivia to see if it were not possible for them to settle the controversy themselves. These efforts fortunately succeeded and the two countries agreed upon the boundary between their respective territories in the disputed region, which is wholly to the north of 15° S. Lat. The unbroken red line on the map shows the boundary between Bolivia and Peru according to the treaty between the two countries signed at La Paz. The following is a translation of that part of the treaty describing the new boundary.

"The line of demarcation between the territories of Bolivia and Peru starts where the actual, accepted boundary begins to coincide with the Rio Suches. It crosses the lake of the same name and extends over the hills Palumani Tranca, Palumani Kunca, the Peak Palumani and the Cordilleras de Yagua Yagua. From this point, the boundary line extends through the Cordilleras of Huajra, Lurini and Ichicorpa, following the mountain range which divides the


71
70
69
BRAZIL
PERU
R. Araca
R. Yacu
R. Xapuri
A. Rami Rami
Arr. de Patos
Platinal
Cascada Inglesa
A. Platinal
Arr. Yaverija
Arr. Nueva
Arr. Nareuda
S. Elena
Sta Rosa
Chapacura
La Curichon
Manchuria
R. Tahuamanu
La Palca
Pacahuara
Miel
Illampu
Illimani
Manuripi
R. Tacuatimanu
R. Pariamanu
R. Amigos
R. Chivé
Florida
Chivé
R. Gaunitana
L. Armentia
Babasori
Amaru
Mayu
El Lavirinto
Pto Maldonado
R. Chonta
Palma Real
Pto Heath
(Pto Pardo)
R. Blanco
R. Ocuere
R. Palma Real
R. Alto Enve
R. Inambari
R. S. Juan
Pando
R. La Torre
R. Malinuski
Pto Markham
R. Brabo
Astillero
El Moro
R. Arasa
R. Tavara
Tambopata
R. Wiener
Arr. Buzos
Pto Mercedes
Pto Candamo
11°
12°
13°


69
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I
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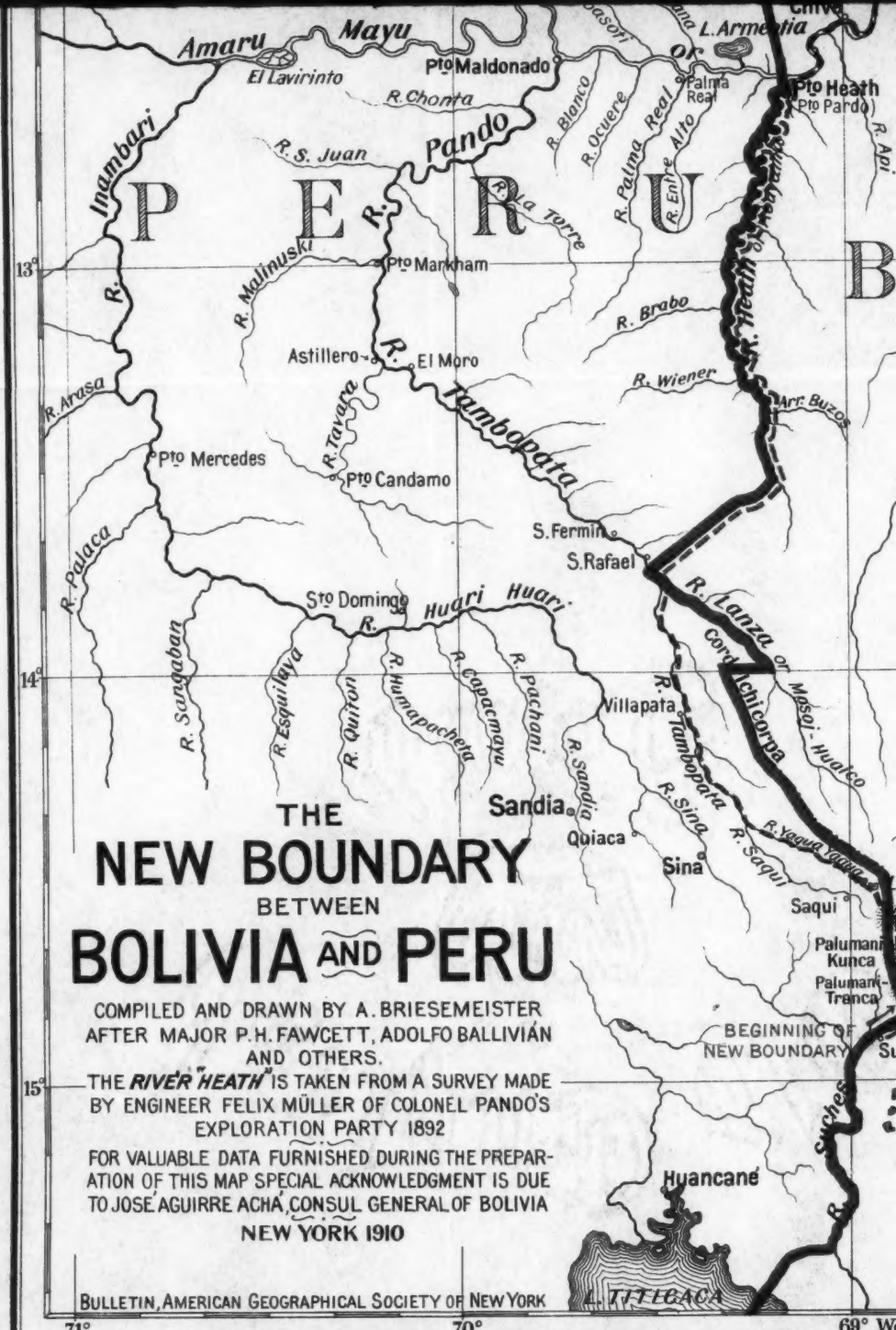
Acre
Xapuri
R. Ina
R. Abuna
R. Rapirran
Sta Rosa
Arr. El Tigre
R. Rhin
Curichon Vial
Abuna Chico
Rio
R. Xipamanu
R. Karamanu
Cobija (Bahia)
Belmonte Viejo
Belmonte
Nazareth
Sta Cruz
Ittimani
Nasebe
R. Orton
11°
Palestina
Peninsular
Puerto Rico
Gironda
Bella Flor
Tahuamanu
Porvenir
Costarica
Bella Vista
Lisboa
Ar. Aveniana
Filadelfia
(abandoned)
Sta Rosa
Buyuyumanu
Buyuyu
Manuripi
Pto Cardenas
Exaltación
Dios
Florencia
Camacho
Copacabana
Momore Ve
Carmen de
Miel
Asuncion
S. Pedro
America
Blanca Flor
R. Sena
S. Silvestre
Madre
Monte Verde
Etea
R. Etea
S. Lorenzo
12°
Carnivali
S. Ramón
Rio
Sinosino
Florida
Sta Rosa
Macu
S. Antonio
Natividad
Mercedes
R. Toromonas
R. Manupari
R. Asunta
Mirlitonville
Sta Rosa
Cavinas
Nuevo Cavinas
R. Avira
Guarayos
R. Vaqueni
R. Alberto
R. Madidi
B O L I V I A
13°
R. Muquiri
R. Janagua
R. Emero
Rio Beni
R. S. Luis
R. Negro
R. Undumo
R. Tequeje



THE NEW BOUNDARY BETWEEN BOLIVIA AND PERU

COMPILED AND DRAWN BY A. BRIESEMEISTER AFTER MAJOR P. H. FAWCETT, ADOLFO BALLIVIÁN AND OTHERS.

THE *RIVER "HEATH"* IS TAKEN FROM A SURVEY MADE BY ENGINEER FELIX MÜLLER OF COLONEL PANDO'S EXPLORATION PARTY 1892

FOR VALUABLE DATA FURNISHED DURING THE PREPARATION OF THIS MAP SPECIAL ACKNOWLEDGMENT IS DUE TO JOSE AGUIRRE ACHÁ, CONSUL GENERAL OF BOLIVIA

NEW YORK 1910

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LITHO BY CHAS. HART. 36 VESEY ST. N.Y.

waters of the Rio Lanza and the Rio Tambopata, until it reaches 14° South Latitude. From this point, it advances east along the same parallel to the Rio Mosoj Huaico or Lanza, which river it follows to its confluence with the Rio Tambopata.

"From the confluence of the Rio Tambopata and the Rio Lanza the boundary line extends to the western headwaters of the Rio Heath and follows this river to the Rio Amaru Mayu or Madre de Dios.

"From the confluence of the Rio Heath and the Rio Madre de Dios, a geodetic line will be drawn, which will start at the mouth of the Rio Heath and pass west of the barraca Illampu, across the Rio Manuripi (leaving Illampu a Bolivian possession), to the confluence of the Arroyo Yaveriji with the Rio Acre; leaving all the territory east of this line to Bolivia and the territory west of this line to Peru."

It is seen that each of the powers retains the territory which was mutually recognized as belonging to each before the award was made. In the south, a comparatively narrow territory is given to Peru which the Argentine Award had conceded to Bolivia. In the middle part of the boundary, the line marked by the Argentine Commission is adopted. In the northern part, a very large territory is given to Bolivia which the Argentine Award apportioned to Peru.

The northern area that is now indisputably Bolivian has large resources in rubber and other tropical products but, as yet, has a very small white population. On the other hand, there are a number of Bolivian settlements, with considerable business interests, on the Peruvian side of the boundary.

By mutual concessions, the two nations have reached an amicable settlement of their boundary difficulties and have supplied a precedent that may advantageously be kept in view by other Latin American republics in the adjustment of frontier questions.

THE GREAT WALL OF CHINA*

The journey up the Chinese coast in clear, mild weather around the Shantung Peninsula, with its bold mountain coasts, is an interesting trip, and gives an easy opportunity to visit the German colony at Tsing-tau, and the eastern end of the Great Wall.

It has become the fashion to speak slightingly of the wall, as a waste of human energy, as an absurd attempt to keep out armies by the sight of a parapet. Travellers, geographers, and military men have jeered at a fortification 2,000 miles long, carried over the summits of inaccessible mountains. A day on the end of the wall at Shan-hai-kwan brings doubt upon these criticisms. The wall was intended for protection against the fearful scourge of Mongol horsemen, who swept down from the north and west, just as their first cousins, the Turks, harried the frontiers of the Greek Empire. Their tactics were a swoop, a dash, and a retreat; they had neither time nor skill for sieges. Hence a forty-foot wall was a real obstacle; even if they scaled it, they could not get their horses over. But they could force their beasts across most of the mountains in northern China, and the wall had to cross the ridges in order to be of real service. The streams were bothering interruptions, and the wall is bent about so as to avoid crossings so far as possible. It was never intended for a rampart across which armies should fight, but as a kind of masonry wire fence; and as such for fifteen or twenty centuries it protected the empire. The proof of its usefulness is that it was repeatedly repaired. It is now so much neglected that parts of it are forgotten; and an American, who is making a study of it, chanced upon a little stretch of two hundred miles which was not on the maps.

No other work of man compares with the Chinese wall for the human labor which it cost. It contains the mass of a hundred pyramids; its masonry would build a dozen Romes or fill six Panama Canals. The stretch of five or six miles across the plain to the

* Mr. Albert Bushnell Hart, Professor of History in Harvard University, published an excellent article recently in the Boston *Transcript* on his travels in China. What he has to say about the Great Wall, which he saw at its eastern terminus, is unhackneyed, and will interest the readers of the BULLETIN. A part of Mr. Hart's description of his railroad journey from Peking to Hankow is also reproduced.

Dr. Geil's book "The Great Wall of China" is the most complete work on this remarkable structure, and is especially notable for the fine series of photographs showing many aspects of the Wall as he followed it throughout its extent.

mountains at Shan-hai-kwan is a majestic structure about fifty feet high, and from twenty to a hundred feet thick. In most places it has a stone foundation ten or twelve feet high, above which it is built of large brick about 15x10 inches, and 3¾ inches thick. Outside is a dry moat, apparently much later than the wall. In some places, especially in the crossings of streams, the inside is also a masonry face; but usually it is simply a slope of earth. The top, where preserved, is a paved road about twenty feet wide, with a parapet, in which are openings intended for swivel guns or cross bows. At intervals of a half mile or so are square towers which once had vaulted rooms for the guard. Outside the mountain section are remains of a much older and smaller wall. On the steep slope the wall rises inside by masonry steps about two feet high. Where the wall crosses streams there are remains of arched bridges now fallen in, but defended by unusually strong towers.

A walk along the top of the wall is delightful. On the outside to the north is a rolling country dominated by four enormous mud forts, some of which were built in 1895 to head off the Japanese. Inside lies the city of Shan-hai-kwan, surrounded by a wall five miles in circumference, over the entrance gates standing the lofty gatehouses, which are the pride of Chinese cities, and fitting into the great wall, which strikes out on the west to the mountains and commands a wide area of farms, villages, and countless graves, a brown and unpleasing landscape.

An extremely interesting rail journey is from Peking to Hankow. The weekly express train makes the whole distance of 800 miles in about thirty hours, but I preferred the slow train which lies up at night and takes the best part of three days. The accommodation was good. As the only first-class passenger, and for most of the distance the only foreigner on the train, I held the one first-class compartment, which was tolerably heated and lighted, and by special permission I was allowed to stay in the coupé over night instead of seeking the terrible Chinese inns. An outfit of provisions, supplemented by the excellent raised biscuit and fruit which can be bought at the stations, and the tea and coffee prepared by the boy in the den next the coupé made the journey comfortable enough. The row of second-class compartments was filled with well-to-do Chinese, one of them a Mongol nobleman and his family. His womankind wore elaborate silks, abounded in jewelry, had the imposing Mongol head dress, which is very like the Alsatian bow, walked on the Mongol clogs and were painted like Japanese dancing girls. Ap-

parently they had never been on a train before, for their lord pointed out a locomotive to them as a great curiosity.

This railway cuts a section through one of the most fertile parts of China, the enormous agricultural plain of the Hoang Ho basin, the home of perhaps a hundred million people. It is not unlike a journey from Buffalo to New Orleans, except that the population is in most places so dense as to make almost a continuous town. Right and left appear high walled cities, interspaced with smaller places. The villages are pitifully poor and foul, shut in by ruinous mud walls, and from the train hardly a building can be seen of any consequence. The villages and farmsteads are simply mud walls with flat roofs. The country is tilled like a garden, for in China the farm that supplies a family may not be more than an acre, on which several crops a year must be raised. The open country is punctuated with tumuli and tombs, with sometimes an absurd little temple; very rarely one sees a Christian church or mission refreshingly clean and neat. At the stations which are always placed outside the large towns, crowds of people assemble; here descends a demure "golden-lily-foot" with gorgeously painted face, her soberly clad mother protecting her; there comes aboard a bold huntsman in long black robe carrying a red banner and a gun over his shoulder, muzzle down, perhaps bearing some little hunting eagles on a perch like the old hawks. At every large station the platforms are crowded with passengers, with uniformed railway guards drawn up in a military line, with sellers of food and comforts for the journey, hot soup out of little hand kitchens, dainties that look like pieces of rope and old slippers, pieces of cotton cloth to wrap up one's belongings, and furs to keep the feet warm. It is a good-natured crowd, and just at present kindly disposed to the foreigner.

For hundreds of miles the railroad traverses this broad and fertile plain, with a fringe of forest behind and the interior mountains in the distance. Here as in most parts of China the eye is caught by the millions of graves. In most parts coffins are placed anywhere in the fields, sometimes left indefinitely on the ground, sometimes encased in brick, sometimes covered with earth. In many places a tenth of the available land is occupied with graves, frequently protected from Fengshuey by a crescent-shaped embankment.

About the midlle of the second day it approaches the banks of the Hoang Ho, which winds back and forth in a channel about half a mile wide and at this point navigable for junks. The bridge is a remarkable feat of engineering; it crosses a good mile of sandy

bottom before reaching the channel, and there have been times when the whole width was filled with a raging stream, which rose almost to the tracks. Since no rock bottom can be found, the bridge is supported by iron piers going down to supports, which rest simply on sand; and after every train passes the bridge must be inspected anew.

At the south end the line strikes the loess country, a region of hills two hundred or three hundred feet high, of stiff, fine material supposed to have been blown from the interior. It stands in fantastic cliffs and pinnacles, and is full of caves, many of which are occupied as dwellings by ladies in green and red trousers, who till the soil in the foreground or hobble about in their bound feet. This bit of loess is only a little corner of a deposit thousands of square miles in extent. Beyond, the country becomes rougher, mountains rise on both sides, and the railroad finally crosses a small range, which is the watershed between the Hoang and the Yangtse Rivers. From Peking to this point hardly a growing tree or a stone has been visible along the track. Now scanty patches of forest appear, and outcrops of rock. The hills are terraced for rice, and houses are seen with peaked roofs. The mountains look barren and worthless, although there are prosperous villages hidden among them. The Yangtse slope gets more rain, and the country looks prosperous.

This railway is a commercial success, and proves that new lines through populous regions will draw a large native passenger travel. The changes in transportation are perhaps the most profound influence at work to change China; more important even than education, for it makes possible a real national life. The Chinese are beginning to traverse their own country, to visit relations from whom they parted a century or two ago. Every mile of railroad is a new bond to hold China together.

THE ORGANIC SIDE OF GEOGRAPHY: ITS NATURE AND LIMITS*

BY

ALBERT PERRY BRIGHAM

At the outset the writer is disposed to adopt a sentiment expressed by H. R. Mill in his presidential address to the Geographers of the British Association,—"Discussion rather than acceptance is the best fate that can befall any attempt at stating scientific truth."

It is not proposed here to define geography. Attempts to form a complete and logical definition often result in mental confusion and unprofitable hair-splitting. The topic concedes an inorganic side of geography which is truly geographic. If relation between inorganic and organic is the only genuine geography, then physical geography, so-called, is all astronomy, geology, physics, meteorology and oceanography. But the physical and the organic are co-ordinate parts of geography and both distribution and relation belong to its concept, freely conceding that the highest synthesis of material and the chief goal of study lie in the field of relation of the earth to life and preeminently in the bond between man and his total environment.

The preliminary suggestion of the President of the Association, looking toward this conference, proposes "The organic, especially the human side, to discuss how far we ought to go in that direction, where useful limits may be set, also to indicate the kind of work on plants, animals and man that is truly geographic and not either botanic, zoölogic or historic."

If we should try to mark off strictly the boundaries between geography and these other sciences, I think we should find warrant in the above proposal, but I have some fear that we should not be able to see the woods for the trees. It is still left to us to find "how far we ought to go and where useful limits may be set." In his presidential address at our second annual meeting Professor Davis named three possible alternatives: (1) that the organic be left to the biological sciences and to history, (2) that the more manifest relation of organic forms be adopted into geography, (3) that we

* Read in opening a round table conference of the Association of American Geographers, Boston, Dec 31, 1909.

include all, even minute ontographic responses. He adopts this third alternative as essentially the position of Ratzel and Reclus, and cites as an example the overlapping of geography and philology in the field of names and terms used by man. Now, this seems to be for the geographer who is learned in philology or is willing to make a laborious journey into the philologist's field. Sound judgment and the measurement of one's powers are desirable, and I incline to the view that most of our work should follow the second alternative, dealing chiefly with unmistakable and commanding relations; in other words, setting "useful limits" in our traverse from the geographic toward the organic center. It will take a long time to delimit and systematize the material of geography and its full organization and definition will come gradually, if at all, as the outcome of many attempts in its several fields. Reclus has characterized the ethnologists as "squatters in the Far West of learning—they erect no structures which pretend to more than a provisional character." In the far future may come "stately edifices of marble." Notwithstanding the age and dignity of geography, some parts of our science are thus provisional, and we should move with deliberate steps. Meanwhile, there is enough ground for every ambitious geographer, ground which he alone is likely to explore.

The aims in this discussion are therefore practical rather than theoretical. We should aim at the best available conception of the earth and its life which is possible to the present generation. Such an attitude does not surrender fundamental problems as insoluble, but faces us most directly toward the broad and deep geographical philosophy which we desire for the future. And it must further be said that the rule of reserve and common sense does not bar out daring excursions for those who are able to make them, but we shall at the same time not lay ourselves open to the charge of making an indiscriminate raid into the fields of the organic sciences.

We will test our conceptions of what may be practicable geography in relation to several organic fields. Professor Clements in his Plant Physiology and Ecology gives the following as the factors of a habitat,—water, soluble salts, humidity, light, temperature, wind, soil, pressure, physiography, gravity, polarity and biotic factors. Geography unquestionably has to do with some of these factors, perhaps with all. But some, such as light, pressure, gravity and polarity, indeed all the factors in some of their special functions, must be left to the investigators in structural and physiological botany. The future, indeed, may develop generalizations which

shall take their place in Geography. Some principles are already available. The plant life of the globe offers a major geographical fact, as also many subordinate divisions of it, as related to land regions, water, climate. Here may also be classed such groups as hydrophytic, mesophytic and xerophytic societies, all depending on more or less abundant supplies of water. The supply of water is in turn dependent on meteorological and physiographic conditions, including the broad relations of continents, oceans, lakes, rivers and ground waters. Or, we may analyze, for example, the hydrophytes, and find free-swimming, pond and swamp societies, or follow the swamp groups and find reed swamps, swamp moors, sphagnum moors and swamp forests. This all sounds very geographic and studies of this sort are essential to even the broadest correct knowledge of the plant world, and thus become indispensable to our work in regional and economic Geography.

Next rises the question, who shall make such ecological study? Obviously, not the ethnographer or the meteorologist, but the botanist, and when the botanist does it he is working common ground, and it really makes little difference whether we call him a botanist, a geographer, a geographic botanist, a botanical geographer, or an ecologist. The essential is that the work is done and that its results are available to the biological specialist on the one hand and to the geographer on the other. The botanist may use the product as subsidiary to plant physiology and the geographer may find aid in understanding the distribution or industries of man, or as helping to form that great synthetic conception of the earth for which he is ever striving.

A similar inquiry relates to geo-zoölogy. Here arise abundant examples of geographic subjects. One of the chief of these is the distribution of animals. Shall the expert in this field be a zoölogist or a geographer? Perhaps he must be both. The answer to this query, in like manner, need not be considered as material. Insect and germ life in relation to public health offers another and specially important example, not only for tropical but for the temperate latitudes. Here the expert must be medical, and he must be trained in biological investigation. Must he be also a geographer? It would appear to be a gain if he is such, but if he is not, how much of his product belongs to geography? Must not the geographer, even though a layman to biological study, find some approach to this domain, and make use of its products? Certainly, the subject will become essential to general education, and geography seems to be

the only school subject which can give it a place. A third example is taken in animal life as related to agriculture and to food. Here is a recognized department of commercial geography, and geography should go farther than it now does in the recognition of importations and economic culture of animals, and in taking account of game protection and the control of disease.

On the other hand, vestigial organs in man, the origin and use of the glands of the stink bug and the evolution of the notochord are clearly subjects for zoölogists,—though even here a fundamental law may yet be made out, so general and so important as to demand a place in geography. If zoö-chemistry is nevertheless chemistry, zoö-geography may surely be considered as geography. It would certainly require a chemist to work in the one field and it does not seem that a zoölogist who is ignorant of geography could achieve in the other. The man who is more zoölogist and less geographer, and the man who is more geographer and less zoölogist would both be capable of certain work. The geographer in the organic field is certainly a geographer by virtue of the relation which he establishes between the physical and the organic.

There remains the still more important field of anthropo-geography. The range of human sciences and arts to which geography may claim a working relation is debatable. We begin at one end of the line where there is no question of right and proceed toward the fields which are more doubtful, or in which, at least, no safe lines have been drawn.

Haberlandt defines ethnography as descriptive ethnology. "It imitates the system pursued in the geography of plants and animals and keeps strictly to the divisions of the earth and their natural configuration, which correspond in the main with the fundamental divisions of the human races inhabiting them." This author makes three groups of factors in the development of man: external, internal and social. Of these the external factors at least cannot be other than geographical.

According to Reclus, we often compare ethnography and ethnology, but "if a distinction is to be made between them, an instinctive perception teaches us to speak of ethnographic facts and ethnologic theories, ethnology being related to ethnography as the wine is to the grape." These words were written many years ago, and would seem to emphasize the mere description and distributional phases more than is consistent with the ideals of the new geography. Must the geographer have nothing to do with the wine? In so far as

physical influence has shaped races, their bodies, homes, tools and customs, the geographer has at least some rights in the field. Perhaps the ethnologist will bear the brunt of the investigation, but his broader results are common property with the geographer and the geographer must supply the physical data which the ethnologist requires.

In approaching history it will promote clearness to observe at least three types of view as regards its relation to geography. To begin at one extreme, the present writer has elsewhere quoted such views as,—"man is what he eats," "character is a function of latitude," and, "history is nothing more than an echo of the operation of geographic laws." If these views were true, history would have to be classed as a mere province of geography, and, in theory at least, the expert geographer ought to be able to reconstruct history from the data at his command. Comment on a similar view is thus made by Reclus, and in so saying he draws a broad moral for over-ambitious geographers: "There is some truth in Buckle's statement that the history of the most civilized nations may be explained by the chemical constituents of their food, but until the action of aliments on bodily and intellectual organism is better known the discussion would be premature."

There is an opposite extreme. Professor G. L. Burr, in discussing a paper read by Miss Semple before the American Historical Association, argues that geography, while a factor, is only one factor. This, of course, all would concede. But he proceeds to urge that man is the more active factor, and that "we must not impute action or causation to things that are inert. This is a figure of speech which gives vigor to style but always involves fallacy." So far as we take this literally, we still must all agree. But possibly a fallacy lurks beneath the charge of fallacy. When the geographer finds a thing, or a group of things, in the field of land form, or in the realm of the atmosphere, or in the under earth, or in the heavens above, whose existence, or contact, or presence, have led to human action or movement of a given sort, is he estopped from saying that these things have *influenced* human life? This seems a sober and ordinary use of the mother tongue, and the geographer knows as well as anyone that a human volition stands between physical things and the current of man's action which we call history.

A more explicit expression of this extreme view is here cited from Mr. J. B. Bury in an essay on Darwin and Modern science:

"Environment and climatic influences must be called in to explain not only the differentiation of the great racial sections of humanity but also the varieties within these subspecies, and, it may be, the assimilation of distinct varieties. Ritter's anthropology has opened a useful line of research. But, on the other hand, it is urged that in explaining the course of history, these principles do not take us very far, and that it is chiefly for the primitive, prehistoric period that they can account for human development . . . . . that physical environment has ceased to act mechanically, and in order to affect their activities, must affect their wills first, and that this psychical character of the causal relation substantially alters the problem . . . . . Most thinkers agree now that the chief clews to the growth of civilization must be sought in the psychological sphere."

Our only comment on this view must be this,—if environment is so powerful to form races, why not to influence them in their maturer development? And by what right do we assume that psychological conditions and resulting actions are something apart from and above environment and in no way historically and genetically related to it?

A third and more reasonable view, which may be called intermediate, is formulated by the historian and statesman, James Bryce,—"Geography has to look upon man as being a natural growth who is conditioned in his development and progress by the forces which nature brings to bear upon him. He is in history the creature of his environment, not altogether its creature, but working out also those inner forces which he possesses as a rational and moral being, but on one side, at all events, he is largely determined and influenced by the environment of nature . . . . . man in his early stages is at the mercy of nature. In process of time he learns to raise himself above her. It is true he does so by humoring her, so to speak, by submitting to her forces. *Natura non nisi parendo vincitur.*"

This statement appears to do justice to all the elements concerned, whether looking at nature or man, at primitive or advanced culture. We need not ascribe anything like volitional initiative in order to credit environment with a strong force in shaping the current of human life. If the substance is there, the fallacy lies in trying to dodge it. If a great body of essential truth is found in a common field, it is a waste of time for the geographer and the historian to wrangle for the possession of it or for some particular

designation of it. It is better to cultivate the ground and reap the mutual benefits of it, a history made concrete and rational and a geography enriched by themes of the highest interest.

Granted that there is a generous overlap of the two subjects, what, precisely, is the geographer's function in the case? If he enters the field of history at all, even on what he thinks is a geographic errand, ought he to turn back, on the more or less current supposition that "a man cannot know anything about a subject unless he knows nothing about any other"? This in no degree represents the general attitude of historians. Indeed, Ripley characterizes Freeman and Bryce as "apostles" of the new emphasis on environment and cites Winsor's Mississippi Valley as another great example. I see no reason why we should not accept for history the principle which Ratzel lays down for ethnographical study, that "the geographical conception of their surroundings and the historical consideration of their development will thus go hand in hand."

As to the actual division of labor, no line can be drawn. From either side it is possible to wander across the boundary, according to the bent of the individual worker. It will fall to the geographer to put in order the physical data, and to the historian will surely remain, as ever, the growth of law, constitutions and political systems and the development of states with their corporate life. But there is another group of themes, as, for example: our progressive knowledge of the globe and its historic availability to man; the relations of major regions to each other and to embracing seas; races or nations in reference to the homes that have molded them; the chain of influence that extends from resources to occupations and from occupations to character; all military operations; the position and influence of lines of migration and transportation; the distribution of population; the fixing and unfolding of centers of industry. Here is a continental opportunity for the geographer and the historian, each to show due reserve, each to enrich the labors of the other, and each able at any moment to retire into fields of research where the other would not think of following him. If geography is ever to push farther into the psychical-historical realm, it will then have demonstrated its right to be there, but this is a problem for the future.

An examination of some standard texts of economics for their scope and content will not be without profit. According to Hadley, economics deals with a nation's commerce and finance. This looks as if commerce belonged to economics and not to geography, but a

further look shows that capital, money, credit, profits, wages, labor and revenue are the typical themes of the economist. Walker's main divisions are: production, exchange, distribution, consumption. These sound geographic, but on examination we find labor, capital, etc., but nothing approaching the geographic conception of production and products. So exchange has to do with money, and distribution with rents, interest, profits and wages. Ely refers to chemistry, psychology, mathematics and the social sciences as related branches of knowledge, and he has a paragraph on "our environment" which closes by turning over the "economic significance of our physical environment" to the economic geographer. He also gives a short chapter on the economic development of the United States, with brief passages on natural resources, agriculture, manufactures and transportation.

Bullock sketches our economic history before taking up economic theory and in so doing touches such geographic themes as the fur trade, cattle raising, agriculture, fisheries and mining, which he calls foundational industries. He has also a chapter on manufactures, transportation, ship building, textiles, iron and steel.

On the whole, while some, perhaps all, of the economists appreciate the value of basal geographic studies, they would seem to leave the whole field open to the geographer, a field unlimited and largely untested in its educational and practical value and possibilities. No geographer need sigh for doubtful excursions into remote territory, while this field, so close to the earth, so close to man and so full of environmental relations, is at his door and is, in effect, all his own.

If geography is basal to economics and is part of the very structure of history, it cannot escape a relation to sociology, a relation so deep and pervading that it cannot be overlooked. I quote a single illustration, drawn from Ripley in his discussion of the racial geography of Europe. He meets the argument that certain social phenomena, as divorce and suicide, seen in France, are racial. "Our theory, then, is this, that most of the social phenomena we have noted as peculiar to the areas occupied by the Alpine type are the necessary outcome, not of racial proclivities, but rather of the geographical and social isolation characteristic of the habitat of this race. The ethnic type is still pure for the same reason that social phenomena are primitive. Wooden ploughs pointed with stone, blood revenge, an undiminished birth rate and relative purity of physical type are all alike derivatives from a common cause, directly physical and coincidently social. We discover primarily an influence of environ-

ment where others perceive phenomena of ethnic inheritance." By a similar argument he urges that divorce and suicide, which are uncommon in the Alpine regions and are common in the densely populated region of commingled races of which Paris is the center, are not matters of race, but follow ultimately upon conditions of environment. Such views, if true, or if partially true, offer a field for geographic investigation. If tilled by a sociologist, he must go back of statistics and economic conditions and know the physical environment in relation to society,—he must become in fact a geographer.

By technology we mean the methods and instruments of the useful arts. How far can we study them as a part of geography? They certainly belong largely to physics and chemistry. Let us take for example the technology of iron.

Iron relates itself to economic geology, in the mode of occurrence, origin and amount of ores, their composition and qualities. Already we have invaded the province of chemistry. Economic geography takes heed of another group of facts, the distribution, national or worldwide; of transportation routes, manufacturing centers and markets. Roughly, there stands between these two groups a variety of technological processes, of mining and handling, of smelting, steel making, steel working, all depending ultimately on mechanics and chemistry, but distinctly human in their relationship. How far are they geographical? Take the basic process. Is an account of it *per se* geographical? No. But a general knowledge and reference are geographical if its adoption should make a great country, as Canada, a foremost producer, when it was not before. We observe also the migration and expansion of the iron industry by the passing of charcoal and the adoption of coal. Likewise the use of charcoal in Sweden is a geographic fact pointing to paucity of coal and to the yet abundant forests of that country. Geography, therefore, especially geographic education, is bound to step broadly across the field of geology and technology in order to reach with sure bearings its own proper territory. And when it has arrived at its own goal, it will find itself close to economic and sociological considerations which can never be far away from so vast and highly organized and highly capitalized an industry as iron represents today. We take another example, wheat. Such considerations as latitude range, climatic and soil conditions, transportation, primary and ulimate markets, are distinctly geographical aspects. But there is a technology of wheat involving the steam plow, the harvester-

thresher, elevator construction and operation, modern machinery and methods of milling. These appliances and processes are mechanical, not geographical, but they and they alone have rendered possible the vast expansion of wheat and made it the bread of nations. Hence these processes have a geographic relation. The geographer will not investigate the processes to minute detail, nor become an inventor of technical methods, but he cannot omit them from his circle.

Wheat, like iron, illustrates the manifold intersection of all circles of knowledge and activity; for further, it has a history, which belongs both to botany and to general history. It is the subject of refined experiments in breeding, in which it is, indeed, botanical, but is also geographical, as when a wheat from an altitude of 11,000 feet in northern India, and a wheat from a high latitude in Russia are brought to Ottawa and crossfertilized, to make an early ripening wheat that will extend wheat culture into the basin of the Mackenzie River.

The qualities of wheat carry us into the domain of nutrition and physiology, but may involve a geographical relation, as when a macaroni wheat is imported from Russia, grown on our Great Plains, and returned by millions of bushels to make the bread pastes of France and Italy. And we need but mention the wheat pit, the railroad and the farm mortgage, or see a Winnipeg bank sending out its daily bundles of currency to move the crop of the Canadian Northwest, to find the relation of wheat to economics, and to see it as the engine of civilization and the opening wedge of history over half a continent.

Cotton and many other products would show the same relation of geography to technology and a similar complex of ties binding it to manifold fields of knowledge and research. But we may challenge any or all of these related themes to take up and co-ordinate all the parts of the great whole as geography is privileged to do.

Such examples, I grant, seem to bear out the view of Mill that geography is "to co-ordinate and correlate all the special facts concerned so that they may throw light on the plan and the processes of the earth and its inhabitants," and is not concerned with the processes of the special sciences. Does this destroy the idea of original research in organic geography and make it a sort of secondary science? I do not think this a fair inference. We might as well charge philosophy with being superficial because it aspires to unify and rationalize all knowledge. Rather adopt the view of Ripley

that geography has made good its claims, "until to-day geography stands ready to serve as an introduction as well as a corrective to the scientific study of human society." What now if the deep researches in the atmosphere are made by the meteorologist and he prefers to be called a meteologist? And suppose the human relations and principles are developed chiefly by the ethnologist, the historian and the sociologist, they using the materials made ready by the physiographers, meteorologists and by their fellow humanists. Does it turn out that geography itself offers no field of research, but may only use second-hand the treasures of more fortunate investigators? Are we thus left without a science? Let us see.

Most of the members of this association are well centered, in biological science, in meteorological science, in geomorphology, in ethnology. I think we are not favored by the membership of anyone who counts himself a historian. And suppose these men are willing to be counted also as geographers, and hold out their hands toward a great common ideal, that unifying grasp of the whole globe and its life which is more than any one science. Is not this enough? Every man has his special field of detailed research. And every man tests and broadens his knowledge by coördinating it with related truth.

And who can doubt that on such foundations, the master mind or minds will arise to construct a more lofty conception of the machinery and life of the globe? This would be the higher justification and apotheosis of the science of geography.

A NIGHT AMONG WILD ANIMALS*

"As game was plentiful at Serah, and there was only one waterhole for the animals to drink from, I thought to myself that this would be an excellent place to make observations by night. I therefore had a boma [inclosure] made close by the spring so that I might sit and watch the various beasts in the brilliant moonshine as they came to quench their thirst. I had the camp purposely

* The BULLETIN referred, in its review of Lieut.-Col. Patterson's book "In the Grip of the Nyika," to the night that he spent in hiding at a solitary waterhole where many species of animals came to drink. Through the courtesy of the Macmillan Company, publishers of that work, the BULLETIN is permitted to print here the author's brief and graphic description of what he saw while lone with the wild life of tropical East Africa.

pitched over half a mile away, in order that the animals should not be kept from the water or be disturbed during the night.

"After dinner I took up my position in the boma, in which I had had many loopholes made, not for the purpose of shooting from, but to serve as peepholes, so that I might be able to see in all directions; and I was well rewarded for the trouble I had taken.

"I had not been in my stockade for more than an hour, when in the distance I heard pad, pad, pad, pad, and a few seconds afterwards up stalked a very tall giraffe, followed by twelve others, their heads being apparently on a level with the tops of the palms. It was the wierdest thing imaginable to watch these huge ungainly creatures stride past within twenty yards, all the time twisting their heads from side to side, keenly on the lookout, and yet totally unconscious of my presence. When they had had their drink at the waterhole, they stalked off again, and later on were succeeded by others at various times throughout the night. None of them went down to the water direct, but circled round it first to see if there were an enemy, in the shape of a lion or other rapacious beast, in sight. One elephant came and had a long drink and a bath, and then leisurely went his way down the bed of the river.

"It was a perfectly still night, without a breath of air blowing, which probably accounts for the fact that the animals did not wind my boma.

"Soon after the first troop of giraffes had gone, a band of about twenty oryx came to within thirty yards or so of the water, and there halted and stood gazing at it. Then, evidently at the command of a leader, all rushed impetuously down into the river bed, drank greedily, and galloped back to their former position. After a pause there, they again charged down together, drank their fill and galloped off into the night, this time returning no more. Undoubtedly, they adopted these tactics owing to their fear of lions lurking in ambush about the waterhole. It is probable that no beast of prey would attack a herd of this size if they meant to stand by one another, as the oryx, with its long, sharp, and strong horns, set on a powerful head, is by no means to be despised as an antagonist, even by a lion. It would be very interesting to know if they would have made common cause against one had he appeared.

"An hour or so after this, scores of zebra came to drink, and then, to add to the interest, a lion at last arrived on the scene, and began to prowl stealthily round. I thought he was coming straight up to my boma, so much so that I reached out for my rifle and went

to the loophole which he seemed to be approaching. I watched carefully for him, but for some reason he must have doubled back and crouched under a clump of bushes which grew on the bank by the water. I did not actually see him go into these bushes, but felt pretty sure that he had hidden himself there. He gave absolutely no sign of his presence, however, and I began to think that he must have gone away along some fold in the ground where I could not see him. I soon found that this was not so, for just then some zebras came along, and as they passed close by, the lion made a mighty spring out of the bushes, pounced on one, dashed it to the earth, and apparently instantly killed it, as it hardly moved again. He lost no time in dragging it to the bank on the other side of the river-bed and over some rocks out of my sight. Here he was joined by several other lions, and the noise they made over their feast was appalling. They all disappeared before daylight, and there was very little left of the zebra when I went out to investigate.

"As the night wore on, rhino after rhino came walking towards the water with the gravest unconcern, every species in the neighbourhood making way for him except his own kind. Finally, towards dawn, the whole place abounded with hyenas. I counted eight all present at one time, and one of these, more inquisitive than the rest, came sniffing round my boma to see what was there, and so paid for his curiosity with his life. He proved to be of a rather rare kind, the striped hyena.

"A night such as this spent among the animals in the wilds, watching their habits and methods both of aggression and self-defence, compensates the lover of wild life for the trials and hardships endured on many a toilsome march in this hot and thirsty land."

GEOGRAPHICAL RECORD

THE AMERICAN GEOGRAPHICAL SOCIETY

MEETINGS OF THE SOCIETY. A regular meeting of the Society was held at the Engineering Societies' Building, No. 29 West Thirty-ninth Street, on Tuesday Evening, March 15, 1910.

Vice President Greenough in the chair.

The following persons, recommended by the Council, were elected to Fellowship:

Emilie Andrews Deen,
Newell Martin,
Bradley Martin, Jr.,
Benson B. Sloan,
Samuel Sloan,
William S. Sloan,
Pierre J. Smith,
Theodore N. Vail.

Vice-President Greenough then introduced the speaker of the evening, Professor A. V. Williams Jackson, of Columbia University, who addressed the Society on "Persia: The Land of the Lion and the Sun." His discourse was illustrated by stereopticon views. The Society then adjourned.

Another regular meeting was held at the Engineering Societies' Building on Tuesday evening, April 26, Vice-President Raven in the chair. The following persons, recommended by the Council, were elected to Fellowship:

J. Coleman Drayton,
T. P. Gilfedder,
Barend van Gerbig,
Thomas M. Osborne,
John B. Stetson, Jr.

Vice-President Raven then introduced Mr. Henry G. Bryant, President of the Geographical Society of Philadelphia, who addressed the Society on "Java: The Gem of the Orient." Many lantern views were shown. The Society then adjourned.

NORTH AMERICA

SURFACE WATERS IN THE NORTHWEST. A report on the flow of rivers of the Northwest that empty into the Pacific Ocean has just been published by the U. S. Geological Survey as Water-Supply Paper 252. These streams are in Washington, Oregon, Idaho, and northwestern Montana.

The report gives records of flow at 127 gaging stations on 83 rivers and creeks; also records of the stage of water on four lakes. The streams range from small creeks to large rivers, including the Columbia. These streams drain areas of widely different character, as may be seen by comparing the barren desert of central Oregon with the heavily forested slopes of the Cascade and Coast ranges, where the annual rainfall in some places exceeds 100 inches.

In the region considered in this report the U. S. Reclamation Service has seven projects under construction, covering an irrigable area of 776,000 acres, and has eight projects under consideration. Private capital is developing at least twelve projects under the authority of the Carey act, the largest, the Twin Falls project, covering an area of nearly 500,000 acres. About 1,500,000 acres are under irrigation in the Northwest and this area will be more than doubled when the projects

now under way are completed. The water power available in this region is very great. The streams draining into the north Pacific Ocean will furnish at low water over 12 million horsepower—one-third of the total for the United States.

SURVEYS IN ALASKA THIS YEAR. The United States Geological Survey has placed twelve parties in the Alaskan field this year. As in previous years, the work will consist of explorations, reconnaissance and detailed surveys, study of the geology and mineral resources, and, in the placer districts, stream gaging. J. W. Bagley, assisted by C. E. Giffin, is continuing the detailed topographic survey of the Eagle River district begun last year. It is proposed to complete the survey of the gold-bearing belt which lies between Juneau and Berners Bay.

A systematic investigation of the Alaska coal fields was begun in 1902. Reconnaissance surveys have now been carried over nearly all the coal-bearing areas that are of immediate economic importance and detailed investigations of some of these areas are now in progress. The detailed survey of the Matanuska field will be undertaken this season. The survey will be made under the direction of G. C. Martin, assisted by F. J. Katz and Theodore Chapin.

The most extensive survey will embrace a region between the Gulkana (a westerly tributary of the Copper) and the upper Susitna. Placer gold has been found in commercial quantities on Valdez Creek and has been reported to occur on other streams in this field. Except for the work of the prospector this region is practically unknown. The plan for this season contemplates a topographic and geologic reconnaissance map of the area lying between the Valdez-Fairbanks trail and the upper Susitna, including the southern slope of the Alaska Range. F. H. Moffit, assisted by B. L. Johnson, will undertake the geologic work in this district. This party will also make a supplementary study of the Chistochina placer district, which has not been examined by any member of the Geological Survey since 1902. D. C. Witherspoon, assisted by C. E. Griffin, will carry on the topographic work.

The water resources available for placer mining in the Yukon-Tanana region will be further determined by C. E. Ellsworth and G. L. Parker, who began work in the Fairbanks district in April and later extended it into the Circle district. Practically the entire Yukon-Tanana area has been mapped, except a belt lying south of the river and west of the Delta. A reconnaissance survey of this belt, which contains some extensive lignite deposits as well as gold placers, will be made by J. W. Bagley, topographer, and S. R. Capps, geologist. The party will land near the mouth of Nenana River about the end of June and go southward to the base of the Alaska Range, there beginning a survey which is to be extended eastward to the Delta, covering the Nenana coal field and the Bonnifield placer district.

The reports from the Innoko placer district are so encouraging that it is now proposed to make a geologic and topographic reconnaissance survey of the more important part of it, including the northern part of the Haiditarod basin. This work will be done by A. G. Maddren, geologist, and C. G. Anderson, topographer.

In Northern Alaska last season, an exploratory survey was extended westward from the lower Yukon to Seward Peninsula. This year it is proposed to carry a similar survey northward from the bend of the Koyukuk to the Kobuk and thence southwestward to Candle, in Seward Peninsula. This expedition will not have time to gather much detailed information, yet it is expected to procure

sufficient data for a general geologic and topographic map which will be of value to the prospector.

Alfred H. Brooks will continue the supervision of Alaskan surveys and investigations. He will be employed in office duties in Washington until about the end of July and will then start for Alaska, where he will join the Martin party in the Matanuska coal field. Later he will visit the Knopf party in the Juneau district and will then go to Fairbanks and finally, in the fall, to Nome.

During the year C. W. Wright will complete the report on the copper deposits of the Kasaan Peninsula and Hetta Inlet regions, U. S. Grant and D. F. Higgins will complete the report on the geology and mineral resources of the eastern part of Kenai Peninsula, and L. M. Prindle will be engaged in preparing a detailed report on the Fairbanks gold district.

THE YAKUTAT BAY REGION, ALASKA. R. S. Tarr's report on the Physiography and Glacial Geology of the Yakutat Bay region, Alaska (Professional Paper 64, U. S. Geological Survey, 1909, 1-144), is based upon two summers' work in a region made classical by the reconnaissance studies of Russell and Gilbert. Additional interest in this area has resulted from the recent great oscillations of many of the ice tongues in the region. The work upon which this report is based was financed by the United States Geological Survey, the first summer aided by a grant from the American Geographical Society. The first of these results were described in the BULLETIN (Vol. 38, 1906, pp. 99-101 and 145-167).

THE SWITZERLAND SOCIETY. A society of this name has been organized in New York whose purpose is "to create and encourage the desire to visit Switzerland and to do everything possible to facilitate the achievement of such object by every member of the society." The society is open to all interested in Switzerland without fee beyond the registration charge of ten cents and 25 cents for subscription to Current Topics, the official organ which is published monthly. H. M. Somner is President and W. Widmer, Secretary, the latter's address being P. O. box 266, Madison Square Branch, New York. We have received from the Society a number of handsomely illustrated brochures on various parts of Switzerland.

SOUTH AMERICA

THE ALTITUDE OF MOUNT HUASCARÁN. The following letter has been received from Mrs. Fanny Bullock Workman giving more particulars of the triangulation work last year, at her expense, of the summits of Mt. Huascarán in Peru (*Bull.* Vol. 42, No. 1, p. 55, 1910). Her investigation was suggested by the statement of Miss Annie S. Peck, who ascended one of the peaks of Huascarán in 1908, to the effect that this Peruvian mountain is higher than Aconcagua, to which Schrader, the latest investigator, had assigned a height of 22,812 feet. Mrs. Workman says:

"Believing Aconcagua to be the highest Andean peak, I decided to have a careful detailed triangulation made of the two summits of Mt. Huascarán. Through the assistance of Messrs. Fr. Schrader and Henri Vallot, acting for the Société Générale d'Études et de Travaux topographiques of Paris, an expedition was sent to Peru for me under the direction of M. de Larminat to effect this purpose.

"Assisted by the Peruvian Government and favorable weather, M. de Larminat

and his assistants were able to carry out this work successfully between August and November, 1909.

"A base 1,600 meters (5,248 feet) long was measured in the Rio Santa valley in the Black Cordillera at an altitude of 3,800 meters (12,464 feet). This base was measured by means of a 50 meter (164 feet) tape of Invar metal. From two stations, one at either end of this base, and from two others, the positions and altitudes of which were determined by trigonometrical measurements from them, that is, from four stations in all, the positions and relative altitudes of the two summits of Huascarán were fixed by azimuthal and zenithal angles taken by theodolite.

"In order to ascertain the true height of these stations above average sea-level, a progressive leveling was conducted from the highest station, called the Garganta Signal, down along the mule-path leading from Yungay by way of Quillo to the sea at the port of Casma.

"The Garganta Signal is higher than the col where the path between Yungay and Casma reaches its highest point. The difference in height between these two was ascertained by triangulation from the Garganta Signal to be 159 meters (521.5 feet). From the col down to sea-level at the port of Casma the leveling was performed by means of the tacheometer. The altitude of the Garganta Signal being thus established, it was an easy matter to fix the altitude of the other three stations, from which the triangulation of the summits was made.

"From two of these stations, from which it was visible, the altitude of the church tower at Yungay was also established at 2,568 meters (8,432 feet).

"The average sea-level was determined by four double observations of two water-marks made at intervals of six hours ten minutes between each. The agreement of these was satisfactory, owing to the small amplitude of the tide at Casma, and also to the fortunate circumstance that the observations were made at time of neap tide.

"The results of these measurements show the height of the north peak of Huascarán to be 6,650 meters, 21,812 feet, and the height of the south peak 6,763 meters, 22,182 feet. FANNY BULLOCK WORKMAN.

"BISKRA, Feb. 18, 1910."

THE FORESTS OF BAHIA, BRAZIL. The depletion of the timber resources of the densely populated states of the northern hemisphere has stimulated a rapidly growing interest in the timber resources of South America. Brazil has been of chief interest in this connection by reason of the large number of navigable streams that drain her forest lands and the nearness of many of her forests to the sea. An examination of the forests of Bahia has recently been made by the American Consul at Bahia with interesting results (Daily Consular and Trade Report, No. 3685, Jan. 14, 1910). The state is wonderfully rich in rare timbers such as rosewood, mahogany and cedar. It is found that between the 13th and 19th parallels of south latitude, and the Atlantic Ocean, there are 12,000,000 acres of choice timber lands which will yield a total of 120,000,000,000 board feet of cabinet woods, the percentages of the different woods, named after their American equivalents or near-equivalents being as follows: Rosewood, 1%; jacaranda cabiuna, 5%; mahogany, 10%; oak, 15%; hickory, 20%; birch, maple, elm, ash, etc., 40%; and Spanish cedar, 9%. The zone of woods has a coast line of 300 miles, along which are numerous ports. Not less than nineteen rivers,

navigable for scores of miles, traverse the region in an easterly direction, an important feature as much of the timber may be driven down the rivers to the sea. A large part of the timber districts is owned by the Government and can be operated only by Government concession. In spite of these favorable conditions, there is, as yet, but little lumber production and some lumber is actually imported from this country. Ordinary lumber costs from 9 to 10 cents per board foot in Bahia.

ISAIAH BOWMAN.

ASIA

PROFESSOR JACKSON'S LECTURE ON PERSIA. In Prof. A. V. Williams Jackson's lecture before the Society, on March 15, on "Persia: the Land of the Lion and the Sun," he said that it is now also the country of the new constitution and the youthful Shah. Herodotus tells us that the Persians were the readiest of all nations to adopt foreign customs and foreign ideas. There was, perhaps, something significant in these words, and in adopting new customs Persia may have lessons to teach in the future as she taught them in the past.

The great table land of Iran covers an area nearly one-fifth as large as that of the United States. Mountains guard its every approach. A portion of the vast plateau is well-watered, but there are no rivers in Persia worthy of the name. Irrigation is widely practiced, and some of the districts of Persia are the most fertile in the world. Railroads are yet to be introduced, as Persia can at present claim only half a dozen miles of track. With transportation facilities the country is capable of great development.

It is most instructive to journey, as the writer has done, past Lake Urumiah in northwestern Persia westward and southward to the historic sites and monuments of Persia's greatest glory in the time of Cyrus and Darius; to visit the homes of the greatest Persian poets at Shiraz on the way towards the Persian Gulf; to cross northward through the central desert to Yezd, the chief headquarters of the few remaining Zoroastrians in Persia; thence to visit the capital, Teheran, and the neighboring Rei, with its ancient ruins; to follow the track of Alexander the Great through northern Iran, visiting the holy city of Meshed; and to cross over the mountain barriers into Russian Turkistan.

MR. BRYANT IN JAVA. In the lecture of Mr. Henry G. Bryant before the Society, April 26, on Java, he described his recent journey along the east coast and through the interior of the island. He was impressed with the distinctly paternal character of the Dutch colonial administration and said it had been the policy of the government, till recently, to discourage foreign travel in the Dutch East Indies. The most prominent features of his lecture were his descriptions of the people in various parts of the island, of his visit to the central volcanic region where he ascended to the crater of the active Bromo volcano, of his excursion to the heart of old Java, where the natives have been least affected by foreign influences and of the famous and colossal ruins, the monuments of the early civilization of the island. The lantern views that illustrated his interesting discourse were especially effective.

EUROPE

THE SERVIAN GEOGRAPHICAL SOCIETY. Our Society has been officially informed of the organization of the "Société Serbe de géographie" at Belgrade. The pur-

pose is to promote geographical science in the largest sense; that is to say, it will include the allied sciences of geology, climatology, phytogeography, ethnography and historical geography, as relates to the Balkan Peninsula, and, especially, Servia. The meetings of the Society will be devoted not only to the purely scientific aspects of the study but also to its popularization. Beginning in January next, the Society will issue a quarterly publication. The President of the Board of Direction is Professor Jovan Cvijic, who occupies the chair of Geography in the Royal University of Servia and is well known for his contributions to the knowledge of Karst phenomena in the Balkan Peninsula.

POLAR

MR. STEFÁNSSON'S NOTES FROM THE ARCTIC. Mr. Stefánsson, in a letter to the *Bulletin* dated "Near Cape Bathurst, Canada, Aug. 26, 1909," says:

"On the night of Jan. 1 a terrible S. W. storm took the ice from the beach at Flaxman Island and by morning it was out of sight. There was nothing but open sea to the Northwest, North and West.

"During the whaling season at Cape Smythe, about May 20, two whaling umiaks belonging to Mr. C. DeW. Brower (the Cape Smythe Whaling & Trading Co.) were carried off with the ice in one of the severe North-Easters. The boats contained 12 or 14 Eskimos and one white man, Mr. J. Hadley. They were beyond sight of land all but the last two days of five weeks and got ashore at Cape Lisburne about 230 miles S. W. of Cape Smythe. They had been without food two days and had thrown away about $5,000 worth of whalebone and whaling gear. They secured no seal or walrus, but two polar bears. When lost they had with them a ration intended for two weeks. None of the men was the worse for the experience. I give this as throwing some light on the movement of the ice.

"Capt. C. Th. Pedersen, of the trading and whaling schooner *Challenge* of Unalaska, told me that near the Jones Islands in August this year he passed a large floe, about a half mile square, which was in parts level, partly covered with rounded hills of ice, and had near one corner a rounded hillock higher than the 'crow's-nest' of his vessel—which, he estimates, is 60 feet above the water. Capt. Stephen Cottle of the steam whaler *Karluk* says he has frequently seen pressure ridges as high as his yards—60 to 75 feet. Both these gentlemen I consider reliable. The 'crow's-nest' is, of course, a good vantage point from which to get the approximate height of objects almost or exactly on a level with the observer's eye. This matter of the height of the ice in the American Arctic Sea is interesting in comparison with the observations of Nansen and others, who place the maximum pressure ridges north of the old world at 35 to 40 feet.

"There are in print, in more places than one, statements to the effect that boulders are rare on the coast west of Flaxman Island, Alaska. Paddling or tracking an umiak along this coast has given one ample opportunity to know that, excepting in river deltas proper, there is not a five-mile stretch without boulders between the location of the mythical "Gwyder Bay" of the maps, just east of the Colville, to Herschel Island, unless it be indeed the first five miles west of Herschel, where I did not follow the shore. There are boulders at Cape Simpson and at various points between that cape and the Colville. Natives say there are boulders here and there inland from Point Barrow. These boulders range in

size from a man's head to the dimensions of a large wagon load of hay, and are of varied structure. I have never seen a stone larger than a hen's egg actually imbedded in the ice, but gravel is common though usually in the form of a mass of frozen earth of a gravelly nature; just as other masses of earth in the ice are sand, still others river silt, peat, etc. Boulders seem especially frequent along the higher cutbanks—leading one to suppose that they are about equally distributed along the various parts of the shoreline. True, there are stretches of a mile or two here and there without a stone of noticeable size; some of these stretches include cutbanks, and even ice-bearing cutbanks.

PHYSICAL GEOGRAPHY

GLACIAL LAKE OJIBWAY. The glacial lakes marginal to the retreating continental ice sheet in the basin of the present Great Lakes have long been described and known. Of those north of the Hudson Bay divide Glacial Lake Agassiz was long ago mapped and discussed by Upham. It has remained for Coleman to give a name to the marginal glacial lake between the Height of Land and Hudson Bay in the region north of the Great Lakes (Lake Ojibway: Last of the Great Glacial Lakes. By A. P. Coleman. Eighteenth *Annual Report* of the Bureau of Mines of Ontario, Vol. XVIII, Part 1, 1909, pp. 284-293). Glacial Lake Ojibway is thought to have covered approximately 33,000 square miles at the maximum stage and to have been not more than 500 feet deep. Its existence is proved by the association of lake-bottom deposits, such as clay and other fine materials, with favorable topographic conditions, namely a northward-retreating ice sheet which would pond back waters against the divide of the Height of Land. Several probable outlets are discussed, the latest being in Quebec east of the Ontario boundary some 300 miles northwest of Montreal. The lake bottom clays are thought to be all freshwater formations and marine deposits are not known to extend more than 450 feet above James Bay. The later relationships of Lake Ojibway are uncertain.

The probable area of this glacial lake, which has been little studied as yet, is shown by a sketch map. Much needs to be done to determine its relations to glacial Lake Agassiz on the west, to the water bodies on the north and to clear up other important questions. LAWRENCE MARTIN.

TERRESTRIAL MAGNETISM. In the Annual *Report* for 1909 of Dr. L. A. Bauer, Director of the Department of Terrestrial Magnetism of the Carnegie Institution (Year Book No. 8, pp. 194-202, plates 12, 13, 14), he notes the completion of the *Carnegie,* the vessel designed for the special needs of a magnetic survey of the oceans, and says that excellent progress was made by all the field parties. Magnetic work was carried on in British North America, Central America, West Indies, Colombia, Ecuador, British, Dutch, and French Guiana, Africa, Persia, Turkey, Asia Minor, southern Asiatic Russia and China. All operations were conducted in regions not easily traversed and in general where very few, if any, magnetic data had been obtained previously. Special expeditions had consequently to be organized and detailed reports given show that they terminated successfully in each case. Besides magnetic data, other information of a geographic nature was obtained. In the office at Washington, the reduction of the observations kept pace with the field-work. However, owing largely to the construction of the *Carnegie* and of her instrumental equipment, it was not possible

to complete the report of the *Galilee* work in the Pacific Ocean (1905-08), but good progress was made, and the results will soon be ready for publication. The report gives a synopsis of the work done during the year.

PERSONAL

Sir Clements Markham has resigned the presidency of the Hakluyt Society. His services as Secretary and President have extended over 50 years. His successor as President is Mr. Alfred Gray, well known by his edition of Pyrard de Laval and Counsel to the Chairman of Committees of the House of Lords.

A geographical Society was organized in the German seaport of Rostock on Nov. 16, with a large membership. Dr. W. Ule, professor of geography at the University in that city, was elected President.

Mr. A. J. Herbertson, reader in geography at Oxford University, has been appointed to a professorship of geography.

Dr. Karl Uhlig, of Berlin, has been called to the chair of geography at Tübingen, to succeed Professor K. Sapper.

Dr. Alfred Grund, of the University of Berlin, has been made professor of geography in the German University of Prague.

The Royal Geographical Society has awarded a special gold medal to Commander Peary for his journey to the North Pole and for such scientific observations as his opportunities permitted; and a silver replica to Captain Bartlett for attaining 88° N. Lat.

Mr. Emmanuel de Margerie, the well-known French geographer and geologist, has been elected President of the Paris Geographical Society for 1910.

At the close of a lecture by Dr. Sven Hedin in Rome, on Jan. 30, the King of Italy gave to him the large gold medal that had been conferred upon him by the Italian Geographical Society.

Dr. R. DeC. Ward has been promoted to a chair of climatology at Harvard University.

Mr. Clarence C. Stewart, who had charge last year of the Carnegie Institution magnetic expedition to James Bay, has been assigned to magnetic work in South American countries, especially in Peru, Brazil and Bolivia.

Prof. R. E. Dodge has a valuable paper in the May number of the *Journal of Geography* on "Geography in the Rural Schools" from the forthcoming volume on "The Teaching of School Geography" of which Prof. Dodge and Miss Clara B. Kirchway are the authors.

Colgate University has conferred the degree of Doctor of Science upon Dr. J. M. Clarke, State Geologist and Director of the N. Y. State Museum.

The Italian Geographical Society has made Sir. Harry Johnston a Corresponding member and given its gold medal to the Prince of Monaco.

Dr. A. Stein, the Asian explorer, has been elected an honorary member of the Scott'sh Geographical Society.

GEOGRAPHICAL LITERATURE AND MAPS

(INCLUDING ACCESSIONS TO THE LIBRARY)

BOOK REVIEWS AND NOTICES

Ferdinand v. Richthofens Vorlesungen und Allgemeine Siedlungs-und Verkehrsgeographie. Bearbeitet und herausgegeben von Dr. Otto Schlüter. pp. 16 and 352, Sketch-maps and Illustrations. D. Reimer. Berlin, 1908. M. 10.

These lectures have been edited by Dr. Schlüter as an historic document, from the year 1891, and not as a contribution to the modern science of geography. They were published as an illustration of Richthofen's method of geographic thought and doctrine. This purpose is made distinct in the preface and disarms criticism that would otherwise be inevitable. But the purpose is one that shows more respect to the master than to geography. To students of earth-lore who were not so fortunate as to have the great student of China as teacher this is not wholly satisfactory. Thirty-five pages of race-classification, for instance, on the basis of straight or curly hair was original with Friedrich Müller in 1873. Here they are of little interest. The mass of readers will recognize that the volume is a memorial one and not for them. Geography is presented as a vast mass of interesting facts about the earth and its inhabitants. That Richthofen cared more for completeness than connection is the strongest impression the book makes on the present reviewer. Thus, in the course of an analysis of Settlements, irrigation is introduced as a step in the development of agriculture and much is said about it, but no word appears to relate it to the geography of agricultural lands, the best of which impose the labor of clearing the forest. "Irrigation," says Penck, "is the easiest way to introduce agriculture for it avoids the difficult task of clearing the forest"; and so agriculture, New and Old World alike, begins in the semi-arid.

How does man occupy the earth and how does the earth guide his movements? Man is the variable, Earth the constant in all the formulæ—is a note that recurs. The Indian lives in wretchedness in the same American landscape where the Anglo-Saxon is prosperous and has leisure. The Tropics could support a dense population but tropic man rests when his labors have procured him bare sustenance. "The domination of the tropics by the races of the Temperate Zone is a necessity for humanity and will be more so as the World's inhabitants become more numerous" (p. 160). The white man is needed to make the black man work. "Civilized man is a product of his environment and his own powers of work."

Attention is called to two groups of dense population in west Europe and southeast Asia, containing two-thirds of Mankind on a tenth of the Earth's surface, while a great strip of nearly empty desert lies between, from the Sahara across Central Asia. North America has a group of some density in the south-

east, South America only strips and patches of a population that is thin at the most.

Of the races which are classified as straight and curly haired, the "Germans" are limited to the parts of the earth beyond the tropics, the Mediterranean people to the tropics and belts close to them, but the American-Mongolian group thrives from pole to equator. Also, whatever selection has done to man, this race preserves its color, cheekbones and hair in every climate. Probably the characters are very old.

Life spread from North to South. Man appeared in America in the Pliocene (Becker, p. 82). Among the great languages, English is seen to be fitly a "world language for trade and intercourse" (p. 102). Linguistic, political and religious groups are described as facts. No claim of geographic character is made.

Permanent settlements come later than fishing and hunting. Fishing often encourages a fixed abode. Nomadism does not necessarily precede agriculture, but does imply private property in tent and flocks at a time when the land may not be regarded as property. We know nothing of how primitive man lived (p. 123). We can never know whether men had developed speech before they separated (p. 127). Pottery was not known to man before the races separated for the Polynesians knew nothing of it (p. 127). Fire, weaving and the making of tools of bone or stone were known at the start.

Division of labor appeared with agriculture, but some agriculture accompanied even hunting and the labor was divided. There are occasional notes of geographic connection. Early agriculture must have had its beginnings in sheltered nooks among the mountains and not on the exposed open plains. Probably the sites were those where hunting and fishing were not good (p. 152). Agriculture is supposed to originate in the casual germination of stored up fruit and grain. In the Tropics, nature offers so little resistance to agriculture that man gains little power of overcoming it. Europe had to wait for its full agricultural use for men who had acquired great powers of overcoming resistance.

Garden culture with irrigation is the type of agriculture that supports the greatest independent populations, as in Asia. Extensive agriculture, using much knowledge of plants and machinery, is developed only in Europe; America and Australia have hardly begun! Such notes of European complacency are rare in the book, and China is often rated high, as in the case of the wheelbarrow, built by the Celestials so as to take the load on the axle and not in the "stupid" European way.

The account of horse, ass and mule is interesting, as also the account of transportation up to steam, which is barely touched for land or sea, save to say that the latter has less modified earlier methods than the locomotive.

Place locations are put by the author in closer relation to features of the earth. Berlin is at a narrowing of the river at an island with high shores making the best crossing over what elsewhere are marshes. Similarly Cologne is at the last high bank along the Rhine. London is said to be rather a reloading place for sea traffic than a point where land traffic and sea traffic meet. Richthofen does not seem to perceive that cities of the magnitude of even Paris or Berlin grow up only on plains of considerable extent.

Sea ports are best at the head of bays that reach into the continents. Bombay is a great port, Calcutta too, and supported by the great river on which it stands, but the author says nothing of the populous *plains* of that river and how

they back it up. The book is a great collection of interesting items that figure in geography and many of them are shown to be related to the earth.

MARK JEFFERSON.

Tahiti. Memoirs of Ariitaimai e Marama of Eimeo Teriirere of Tooarai Teriinui of Tahiti Tauraatua i Amo. 196 pp., and Map. Henry Adams, Paris, 1901.

How is it that the interesting memories of Ariitaimai, of the best blood of Tahiti, daughter of the high gods, after all these years have come to light in English and from Paris. Only at the climax of her life do we find any recognition of the work of an assisting hand, and then only so much as may be implied in the single sentence "I repeat it in my own words which are more lifelike than any that an editor could use."

A quarter of a century ago Mrs. Salmon was the most interesting figure in the eyes of all such as sought to know more of Tahiti than could be seen along the Broom Road or in the gay glitter of Papeete. She was the last of a great race, the greatest race of her folk, the one survivor of four lines of masterful chiefs. Not in Tahiti was there a mate for her, she chose an Englishman and never regretted her choice, and her son Tati Salmon carries her nobility undiluted. To those for whom she chose to permit acquaintance to be warmed by courtly intimacy she was a mine of information as to the present and the long past of her people. Those who have had the pleasure of hearing her words will be disappointed to find that with her the pen is far short of the tongue.

The most instant value of these memoirs lies in the check upon the blunders of the early voyagers. Beginning with Wallis and the discovery of Tahiti in 1767 she brings names to the correct spelling, yet there are many which have evaded even her ingenuity. However this is not the case with Wallis's "my princess, or rather queen" whose name he never knew, although he was dissolved in tears at their parting. Cook discovered her to be Oberea, and Mrs. Salmon is in a position to give her name truly, for she was her aunt Purea. If for nothing else the work would be valuable as enabling us to elaborate a series of satisfactory footnotes to Cook, Forster, Hawkesworth and the missionary voyage of the Duff. This holds good beyond mere names, the good lady explains much that was a mystery to the early voyagers.

But Ariitaimai supplies a greater puzzle of her own. Mrs. Salmon was very wise in the lore of her race, she was a library of tradition and genealogy. On the other hand the writer of these memoirs is at fault in all the history which is not set down in print in foreign works. At the beginning of chapter xv it is written: "but as I come to the dark ages of our history, between 1800 and 1815, I find a want of records and traditions that shows how narrowly our family must have escaped the fate of almost every other chiefly race." The gap is in the European accounts of Tahiti, the period in which the London missionaries had fled for life; such a gap can scarcely be conceived to exist for the Mrs. Salmon known to us. It is hard to understand.

The frame of mind of the writer of these memoirs is wholly European, the thought is not Polynesian at all, the writer writes of Tahitian affairs as one who comprehends from without imperfectly inward and not as one to whom all these things are known from childhood. This holds good not only of the early parts

of the work but of the final chapter distinctly stated to be "in my own words." We can discover no difference in diction or turn of thought between the two parts.

There is a particular interest attaching to the last chapter, the events of 1846 with which the narrative closes, although Mrs. Salmon lived a long life after that. There are not wanting those in Tahiti who declare her a traitor. Certainly she acted on the side of the French and was the agent of Bruat in securing the surrender of Aimata, the last sovereign of the Pomare title. They had been brought up together as children, but Ariitaimai is at no pains to hide her disdain of such inferior royalty as that of the Pomares with their initial taint of Paumotu blood. Her narrative should be read in connection with the early chapters of Pritchard's "Polynesian Reminiscences." She pays her respects to the elder Pritchard. More gallant or less observant, the junior Pritchard leaves her out of his somewhat envenomed narrative of the same events. Yet it matters little now. It would be vanity indeed to seek to find out verities in the fated downfall before European needs of an impractical South Sea monarchy.

It is a most interesting volume yet one which may not safely be cited haphazard as authority.

WILLIAM CHURCHILL.

The Geology of the Whangaroa Subdivision, Hokianga Division. By J. M. Bell and E. de C. Clarke, New Zealand Geol. Survey, Department of Mines, *Bull.* 8 (N. S.) pp. 1-115, 17 illustrations, 8 maps, and 4 geological sections. Wellington, N. Z., 1909.

This report continues the description of New Zealand along lines laid down in the first reports of the series. The division forms the northern part of the mainland of North Island. In the first chapter is an excellent description of the chief geographic features of the region, the fauna, flora, timber, climate, early history, population, industries and means of communication. Of special interest is the description of the Kauri Bush, and the discussion of the various types of vegetation that respond in their distribution and character to the physical geography of the region. On p. 16 is a description of the lumbering methods employed where the rough country and lack of population make ordinary methods difficult.

Perhaps the most curious industry is the gathering of kauri gum that still supports a kind of semi-nomadic population. The gum is dug from almost treeless gumfields where once great forests stood that were probably destroyed by the Maoris. The gum is usually but a few inches below the surface and in the swamps is found at all levels as far as ten feet below. The earth is probed with a spear and when a find is made the gum is either unearthed by digging or is brought to the surface by a hooked spear.

The chief physiographic features may be described as an uplifted and faulted peneplain maturely dissected, and, more recently, slightly depressed. Two erosion levels have been identified, each ancient surface having been to a certain extent masked by lavas and breccias before uplift and dissection began. The various topographic districts to which these events gave rise are discussed in detail. The description of the many interesting shore features is especially full and well illustrated. The greater part of the report deals with the geology of the region with especial reference to the occurrence and development of economic resources.

ISAIAH BOWMAN.

Report of the Mississippi River Commission. Annual Report of the Chief of Engineers, 1909. Appendix PPP. pp. 908-910, 2641-2845. 39 plates. Index. Government Printing Office, Washington, D.C., 1909.

This report of the Mississippi River Commission for the fiscal year ending June 30, 1909, does not differ in any essential degree from the form of the earlier reports.

For the last three years, the Commission has reported the caving at Walnut Bend, 281 miles below Cairo, which threatens to make a cut-off into the St. Francis river (see Figure). This has been prevented up to this time by abattis dikes

WALNUT BEND IN THE MISSISSIPPI.

which, acting as bar builders, cause a deposit of sand to accumulate in the caving bends and thus turn the threatened bank areas into localities of deposit instead of localities of scouring. The Commission gives as the main objection to a cut-off here the expectation that the low-water level of the St. Francis river would in case of a cut-off be raised from 8 to 10 feet and thus inundate much land normally under cultivation.

The low-water stage, autumn of 1908, was lower than it has been for five

seasons, and in addition it was of considerable duration. A stage below 10 feet was recorded on the Cairo guage from Sept. 14 to Dec. 2, with the exception of nine days in November. The low stage continued much later than usual, a consistent rise not beginning until Jan. 18, 1909. At five crossings, less than the depth stipulated for navigation appeared, but the dredges were able to remedy the condition quickly.

The high water of 1909, which came largely from the Ohio basin, was 1.72 feet higher at Cairo than the 1908 flood, but it was of much shorter duration. The river was 29 days above the 40-foot stage at Cairo in 1909, as against 76 days in 1908. At Vicksburg, it was above the 45-foot level 45 days during 1909 and 114 days during 1908. The high water was made dangerous at a few localities by the breaking of severe wind storms during the crest of the flood. The waves thus formed, beating against the levees during a full stage of the river, intensified the wear of the banks.

The Commission reports that the levees are 78.5 per cent. completed and are now protecting 26,569 square miles of territory. The only district completely protected is the Upper Yazoo. The loss of levees during the past year by caving amounted to one and one-fifth per cent. of the entire content now standing. This loss was due to abandonment because of threatened destruction and not to the breaking of the levees. No breaks were recorded.

The report is illustrated by many plates, including the hydrograph for the year. Special mention should be made of the comprehensive hydrograph of the river from 1871 to the present time. The report has an index, a feature which was added for the first time last year. The data of previous reports are rendered almost useless, and especially so because of the arrangement of the material, by the total lack of any guiding words. The introduction of the index is a welcome addition and makes it possible for the student or the lay reader, who is seeking for certain information, which in these reports is generally scattered throughout the volume, to turn quickly to the portions of the report of interest to him.

R. M. Brown.

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AFRICA

ABYSSINIA. Schizzo dimostrativo dei Confini dell' Impero Etiopico. No scale. Illustrates "I confini e l'area dell' Impero Etiopico," by Attilio Mori in *Rivista Geog. Ital.*, Vol. 17, Nos. 3-4, Florence, 1910. [Shows the boundaries of Abyssinia and the extent of surveys along them.]

BRITISH EAST AFRICA. British East Africa Protectorate. 1 inch=54 miles. Inset, Plan of Mombasa, 1 inch=3.017 miles. Illustrates Drumkey's Year Book for East Africa, Nairobi, 1909. [Provinces are shown in colors and game reserves are outlined.]

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FRENCH WEST AFRICA. Côte d'Ivoire. 1 inch=200 kil. With paper "Les Troubles de la Côte Ivoire," by Georges Demanche. *Rev. Franc.* No. 376, Paris, 1909. [Four small black maps illustrating the political situation, 1908-9.]

SOUTH AFRICA. (a) Sketch Map showing the Trionometrical Connection between the previously existing Geodetic Surveys in the Transvaal and Southern Rhodesia. No scale. 20° 15′-22° 15′ S.; 29°-30° E. [Shows triangulation net, streams, mines, etc.;] (b) Diagram of Triangulation in South Africa. 1 inch=29.5 miles. [Gives, in colors, astronomical stations, and the triangulation net in the several colonies;] (c) Diagram of Triangulation for solution of vertical heights; (d) Diagram of vertical section of base lines. [50 fold

exaggeration of vertical scale.] Geodetic Survey of South Africa, Vol. V, London, 1908. [This work contains an account of the operations in the Transvaal and Orange River Colony which completed the Geodetic Survey of British Africa south of the Limpopo, and of the connection of that work with the previously existing geodetic triangulation of Rhodesia. The connection of these independent surveys shows their mutual agreement.]

SOUTH AFRICA. Diagram of the Geodetic Triangulation of South Africa. 1:3,500,000=55.2 miles to an inch. Ordnance Survey Office, Southampton, 1908.

ASIA

CHINA. (a) Colored Chart of China Coast, no scale, showing position of lights and limits of Customs Districts; (b) Nine colored Charts, no scale, showing position and kind of lights. Illustrates "List of Lighthouses, Light-Vessels, Buoys and Beacons on the Coast and Rivers of China, 1910." Imperial Maritime Customs, III—Miscellaneous Series: No. 6, Shanghai, 1910.

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AUSTRIA. Karte des politischen Bezirkes Hietzing- Umgebung. 1:100,000=1.5 mile to an inch. G. Freytag & Berndt, Vienna, 1910. Heller 20. [A good, cheap hand map for use in the schools of this district.]

AUSTRIA. G. Freytag's Verkehrsplan der k. k. Reichshaupt-und Residenzstadt Wien. 1:15,000=1250 ft. to an inch. G. Freytag & Berndt, Vienna, 1910. K. 1. 20. [A first rate plan of Vienna, giving all information needed by the general consultant, including numbers of houses on so many street corners that any person may easily find any residence that he wishes to visit. All details may be read without difficulty. Sheet 2 is a similar map of Floridsdorf, the new ward of Vienna on the east bank of the Danube. The sheets are bound in with an index referring to letters and numerals on the map margins.

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Vienna, 1910. Paper, K. 4. [A good physical and political map with 9 tints for elevations above the sea, rail and wagon routes, mines, ruins, caves, heights in meters, etc.]

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RUSSIA. Diagrams showing commercial movement on the Volga-Neva-Maria Canal, forty years ago and at present. With paper "Commercial Movement in the Volga and Neva Basins during the past Forty Years. By I. F. Borkowski. *Isviestiia* I. R. Geog. Soc., Vol. 45, No. 10, 1909. [Gives ports and illustrates development of steam traffic, volume of freightage and kinds of merchandise transported.]

RUSSIAN EMPIRE. Map of Routes in the Russian Empire. 1 inch=450 versts. With paper "Commercial Movement in the Volga and Neva Basins for the last Forty Years." By I. F. Borkowski. *Izviestiia* I. R. Geog. Soc., Vol. 45, No. 10, 1909. [Colors show water and rail connections in the Empire and their relation to routes in adjacent countries.]

SWEDEN. Karta öfver Sveriges Jernvägar och med Statsbidrag byggde Landsvägar och Hamnar. 1:1,000,000=15.8 miles to an inch. Inset of Skåne on 1:700,000. Bidrag till Sveriges Officiella Statistik S) Allmänna Arbeten 37. Vag-och Vattenbyggnadsstyrelsens Underdåniga Berättelse för Året 1908. [Map in colors of the Swedish R.R. systems and the connecting highways. An interesting feature is the series of wagon roads that have been built from the eastern frontier to connect with the Arctic R.R., at Gellivare, which extends across Lapland to the port of Narvik where it connects with Atlantic steamers.]

UNITED KINGDOM. L'Église catholique dans les Iles britanniques. 1:1,280,000=44.19 miles to an inch. Supplement to *Les Missions catholiques,* 1910. [Upon an excellent map of the United Kingdom, with hill features in brown, many heights in meters, railroads, etc., are imposed, in red, the seats of archbishops and bishops and the boundaries of dioceses. All places shown on the map have at least one Catholic church.]

OCEANS

INDIAN OCEAN. (a) Monatskarten des Luftdrucks. [12 black charts on one sheet giving isobars over the Indian Ocean for each month in the year;] (b) Monatskarten der Lufttemperatur. [Isotherms for each month;] (c) Monatskarten der Oberflächentemperatur. [Surface isotherms for each month.] Illustrates paper "Monatskarten des Luftdrucks sowie der Luft und Wassertemperatur für den Indischen Ozean nebst angrenzenden Gebieten," *Annal. d. Hydrog. u. Maritim. Meteorol.*, No. 4, 1910.

ATLASES

ATLAS UNIVERSEL DE GÉOGRAPHIE. Ouvrage commencé par Vivien de Saint-Martin et continué par Fr. Schrader. No. 73, États-Unis d'Amérique en 4 Feuilles. Feuille I (Nord-Ouest.) 1:5,000,000=78.9 miles to an inch. Hachette & Co., Paris, 1909. [The sheet covers the northwestern part of the U. S. from the Canadian border to the latitude of Los Angeles and from the Pacific to about the middle line of Minnesota. It completes this map of the Republic and, according to the explanatory text, the sheet was prepared with great difficulty owing to the unequal value of our official map material used in its compilation. Our topographic surveys, by no means, yet cover the area embraced on the sheet. Manitoba, and the southern parts of Saskatchewan and British Columbia are also included on the map.]

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